Turid Lingaas Holmen

SMOKING AND HEALTH IN ADOLESCENCE
The Nord-Trøndelag Health Study, 1995-97
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List of papers


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## Abbreviations and definitions

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ATS</td>
<td>American Thoracic Society</td>
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<tr>
<td>ERS</td>
<td>European Respiratory Society</td>
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<tr>
<td>ISAAC</td>
<td>International Study of Asthma and Allergies in Childhood</td>
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<tr>
<td>FVC</td>
<td>Forced vital capacity</td>
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<tr>
<td>FEV1</td>
<td>Forced expiratory volume in one second</td>
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<tr>
<td>FEF50</td>
<td>Mid forced expiratory flow</td>
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<tr>
<td>FEV1/FVC</td>
<td>Percent forced expiratory volume in one second in relation to the forced vital capacity</td>
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<td>PET</td>
<td>Forced expiratory time</td>
</tr>
<tr>
<td>ATP</td>
<td>Ambient temperature pressure</td>
</tr>
<tr>
<td>BTPS</td>
<td>Body temperature pressure saturated</td>
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<tr>
<td>CI</td>
<td>Confidence interval</td>
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<td>OR</td>
<td>Odds ratio</td>
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**PACK YEARS**  
The number of years with daily smoking multiplied by the number of cigarettes smoked daily divided by twenty.

**HUNT**  
The Nord-Trøndelag Health Study (Helseundersøkelsen i Nord-Trøndelag)

**young-hunt**  
The youth part of HUNT
Summary

Background and aims

The onset of cigarette smoking begins primarily in adolescence, and prevalence of smoking among adolescents has been increasing during the last ten years. The prevalence of adolescent smoking increases with age and is more common or at least as common in girls as in boys in most western countries.

Until recently the intensive investigation on health effects of smoking has been mostly conducted among adults. In adolescence the long-term health consequences have been reviewed, but current health problems are probably more important to adolescents and may be more motivating for smoking prevention and cessation. Increased morbidity among adolescent smokers has been reported, but specific current health problems and medication use have received little attention. More attention has been given to associations between smoking and respiratory symptoms and lung function, but very few have focused on possible gender differences in adolescents.

Control of smoking is a primary health goal. An underlying premise for promotion of physical activity in adolescence is that it may lead to a healthy lifestyle persisting through adulthood. Encouraging participation in sports has been recommended as smoking prevention and as part of smoking cessation programs. Smoking habits within different types of sports has received less attention, and whether physical activity has an impact on lung function is debated.

Adolescent smokers are often unsuccessful in quitting and difficult to recruit and retain in smoking cessation programs. Occasional smoking may be the strongest risk factor for daily smoking, but occasional smokers are found to quit smoking more often than daily smokers. Thus, occasional smokers could be an important target group for smoking cessation who could be discouraged from moving into daily smoking status.

The first aim of this thesis was to study associations between smoking and current health status by examining associations between daily smoking and subjective health problems
(Paper I), and gender specific effects on respiratory symptoms and lung function (Paper II). The associations between physical activity and lung function in never smokers and daily smokers were also assessed (Paper III). The second aim was to study factors that might be useful in smoking prevention and cessation by examining the associations between smoking habits and exercise and different types of sports (Paper III), and differences between occasional and daily smokers (Paper IV).

**Material and method**

The young-hunt study is the youth part of the large Nord-Trøndelag Health Study (HUNT II), conducted in Nord-Trøndelag County, Norway, from 1995-97. Adolescents in Nord-Trøndelag, 13-19 years of age (9917 individuals), were invited to this cross-sectional study, the participation rate was 92%. The young-hunt study was conducted in schools. Information on smoking habits, health problems, physical activity and individual and environmental factors was obtained from a self-administered questionnaire. Within a month after completing the questionnaire, the students underwent a clinical examination including measuring of spirometry and body size measures. Spirometry was performed by specially trained nurses in accord with American Thoracic Society (ATS) standards. The acceptability of spirometry results was assessed both during the testing and during the data analysis.

The study population presented in this thesis consists of adolescents, aged 13 –18. Youth who participated in the questionnaire were included in Papers I and IV, and youth, without asthma, who participated both in the questionnaire and the spirometry were included in Papers II and III.

**Results and conclusions**

Of the adolescents who answered the questionnaire, 55% of boys and 57% of girls had tried smoking, at least one cigarette. In the age group 13-15 years, 5.9% of boys and 9.3% of girls reported occasional smoking while 6.4% of boys and 5.7% of girls reported daily smoking. In the older age group, 16-18 years, 10.8% of boys and 12.8% of girls reported
occasional smoking and 14.1% of boys and 18.4% of girls reported daily smoking. Mean age of smoking initiation was 13.9 years in both boys and girls. In average, boys smoked more cigarettes daily (9.8 cigarettes) than girls (7.9 cigarettes) (p<0.001).

Compared to boys and girls who had never smoked, daily smoking in both sexes and all age groups was associated with significantly poorer perceived health, respiratory symptoms, headache, neck and shoulder pain, stomachache, nausea, frequent heart beats, nervousness/restlessness and sleep problems. Daily smokers used more medications and health services. Whether or not the association is causal, daily smoking identifies a group of adolescents with health problems, for whom preventive strategies should also imply medical and social support.

Smokers had a higher prevalence of respiratory symptoms than never smokers. Symptoms increased with smoke burden. Compared to boys, girls reported more respiratory symptoms and greater increase in symptoms with comparable smoke burdens. A dose-response relation between smoking and reduced levels of lung function was found in girls only. Both boys and girls with light smoke burden had higher lung capacity (FVC) than never smokers. Girls were found to be more vulnerable to the effect of smoking on respiratory symptoms and lung function than boys.

Frequency of physical exercise was inversely associated with smoking, but participants in some types of sports were more likely to be daily smokers, especially in girls. Both daily smokers (53%) and occasional smokers (43%) were more likely to have quit sport than never smokers (26%). In never smokers, a positive dose response was found between physical exercise and better lung function (FVC and FEV1, adjusted for age and height); no similar significant association was observed in daily smokers.

Compared to daily smokers, occasional smokers participated in higher academic courses, were more engaged in organized activities and sports, had been less drunk and had better family role models. Occasional smokers quit smoking more often than daily smokers.
1 Introduction

Anything that primitive man was unable to explain was held to be of divine origin, so also the fire. As he learned to kindle it, he watched the curling tongues of flame and the dense clouds of smoke soar upwards and conceived the idea of worshipping the sun with offerings of holy fire and holy smoke. In time, the priests found the smoke from the sacrifice injurious to their breathing and endeavored to lessen the harmful effects of the acrid fumes by burning sweet herbs and odoriferous gums. In Central America, the tobacco plant was used. The priests came to inhale the smoke and soon realized the pleasing narcotic effects of tobacco. Thus it is believed that tobacco originated as a plant of healing and ceremony among the Mayans and Aztecs of Central America 1.

When introduced to Europe by the Spanish and Portuguese explorers, its reputation as a cure for every ill spread rapidly. It was first "smoked" in the modern sense in England, but was in the beginning violently opposed in all parts of the world by Kings, Pope, Emperor, Tzar and Sultan. In spite of this the smoking habit triumphed, and the attitudes changed in the 18th century when tobacco was accepted as an effortless way for governments to raise money through taxation.

In the beginning of the 20th Century smoking cigarettes was considered vulgar and ill bred in Norway, especially among women. But, through the first half of the Century mass production, intensive marketing and lack of health information made smoking a symbol of progress and freedom, resulting in an explosive increase in cigarette smoking. Around 1950 three out of four adult men in Norway smoked 2.

Health effects of cigarette smoking have been the focus of intensive investigation since the 1950s. Causal linkage between smoking and serious health consequences has been extensively documented 3-4. With comprehensive information and Governmental users protection, there has been a marked decline in smoking prevalence in men during the last 20 years, and smoking in women has never reached the large proportion once seen in men 2. Smoking is still considered to be the chief preventable cause of premature disease and death in the Developed Countries,
and in the world today one person dies every eight second as a consequence of smoking (World congress on Lung Health 2000). In Norway about 1/3 of the population are presently smokers, and the prevalence of smoking is increasing in adolescence.

Preventing smoking among young people is likely to affect both duration and intensity of total tobacco use, potentially reducing health consequences significantly with large impact on public health.
2 Background

2.1 Cigarette smoking in adolescence

2.1.1 Prevalence

During the first half of the 20th century, people became regular smokers at progressively younger ages, so that by the 1990s, the vast majority of smokers appeared to have started smoking before the age of 20. In most western countries smoking prevalence among adolescents declined sharply in the 1970s, but the decline slowed during the 1980s and turned to a new increase in the late 1990s.

The National Council of Tobacco and Health has regularly collected information on the prevalence of smoking in Norway. The latest data for the age group 13-15 years (students attending junior high schools) are from 1995 when, in the country as a whole, 8.0% boys and 9.4% girls reported daily smoking, and 15.1% and 19.7% respectively reported occasional smoking. The prevalence differed between counties, and was lowest in the county of Nord-Trøndelag (6.9% boys and 4.9% girls reported daily smoking. Data on occasional smoking from each county has not been published). In 1995, 22.6% of boys and 20.8% of girls in the age group 16-19 years, reported daily smoking. This had increased to 23.8% boys and 26.3% girls in 1999. The latter data are collected yearly by interview from a sample of only 350 persons, and cannot be broken down by county (Rita Lindback The National Council of Tobacco and Health, personal communication). Compared to the data from the National Council of Tobacco and Health, the prevalence of smoking in the young-hunt study was somewhat lower than the national mean, but was consistent with the prevalence reported for daily smokers, 13-15 years, from Nord-Trøndelag county (Table 1, Paper IV). The prevalence of adolescent smokers differs between different countries, cultures and races. The prevalence of smoking in Norwegian adolescents is in consistency with other comparable countries.

Large and increasing numbers of adolescent cigarette smokers, and early initiation enhances the importance of early intervention in smoking prevention.
2.1.2 Predictors of smoking

Young people appear to progress through a sequence of stages from receptivity to dependency of tobacco. This process runs from attitudes and beliefs about tobacco, trying, experimenting with, and regular use, to being addicted. Both environmental and individual factors influence this progress. Susceptibility to smoking, attitude, family role models, peer influence, self-esteem, advertising, depression, and anxiety are all said to play important roles in initiation of childhood and adolescent smoking. Attitude towards cigarettes and smoking role models, in combination with poor adjustment in school and access to cigarettes, appear to make early initiators more likely to continue smoking.

Previous research has suggested that early initiation predicts longer duration, heavier daily consumption, and greater chances of nicotine dependence. Smoking is clearly a long-term addiction for many adolescents who start smoking.

2.1.3 Intermittent smokers

During recent years occasional smoking has been found to increase as frequently or more frequently than daily smoking in young people. More occasional smokers are seen among people with higher education. Students at the University of Oslo expressed, during interview, that occasional smoking was associated with the ability to take control, a desired quality, whereas daily smoking was considered negative (Per Schiodborg, personal communication). Although occasional smoking may be the strongest risk factor for later daily smoking, intermittent smoking can be stable, and light, nondependent cigarette smokers ("chippers") have been described in adults. Their motive for smoking may differ from that of daily smokers, but little attention has been paid to possible characteristics of occasional smoking in adolescents.
2.1.4 Gender differences

Smoking increases by age in both sexes and is more common or at least as common in girls as in boys in most western countries. The age of smoking initiation has been reported to be equal in boys and girls, but, among daily smokers, boys report smoking a higher number of cigarettes per day. A review article on gender differences in adolescent smoking reported both similarities (peer influences and parent modes) and differences (smoking girls being more socially skilled and more concerned about body weight). Different concern about body weight has also been reported in Norwegian adolescents. Studies have evaluated changes in gender roles and smoking and suggested that smoking may have different meaning for boys and girls. Others have concluded that the complex combinations of risk factors and processes leading to smoking are fundamentally different in boys and girls. More frequent smoking among girls and other possible gender differences may suggest that prevention programs should be specially targeted.

2.2 Health problems in adolescence

Adolescence is a period with few serious health problems. Most young people perceive their health as being good. A Nordic study from 1984 found that 9% of adolescents, 13-18 years, had a long-term illness or malfunction, but long-term illness is not necessarily consistent with less good perceived health. Adolescence is characterized by rapid physical growth, marked psychological development and changes in personal relations. Many positive factors such as feeling happy, being well integrated socially, and having a positive attitude towards school are found to be associated with feeling healthy.

2.2.1 Subjective health problems

Subjective health problems such as headache, muscle pain, back ache and stomachache have been given less attention in adolescence than health risk behaviors such as smoking, drug abuse, alcohol intake and injuries. Studies on subjective health have most often
included young adolescents together with children, and older adolescents together with adults. Reported pains are found to be frequent\textsuperscript{46-48}. Monthly pain has been described by 78\% of young people on Iceland (11-16 years) and in 54\% in the Netherlands (0-18 years)\textsuperscript{47,48}. The most common types of pain were headache, limb pain and abdominal pain.

Reported subjective health problems vary, however, between countries. In the WHO cross-national survey from 1993-94, Norwegian 11-15 years olds reported less headache, stomachache and back pain compared to many other countries\textsuperscript{13}. Repeated cross-sectional studies indicate that subjective health problems in 15 year olds have increased in Norway during the period 1983-97\textsuperscript{10}. Whether this is a real increase or due to different classification remains uncertain. Although only 10\% perceived their health as poor, nearly 50\% of the students in the young-hunt study reported subjective health problems and the prevalence of problems increased with age (Appendix 6, tab 2.1).

Subjective health problems can be of organic origin, but are also found to be associated with psychological stress, and seem to be associated with depression\textsuperscript{13,46,49}. Problems are reported to be stable in the same persons during adolescence\textsuperscript{46}. Thus, already in adolescence there seems to be a group of teenagers who consider their health to be less good year after year.

**Gender differences**

Girls are found to report subjective health problems more often than boys in the young-hunt study (Appendix 6, tab 2.1), as well as in many other studies and in most European countries\textsuperscript{10,13,46,47,50,51}. The reasons are not known, but expressing health problems might be more acceptable for girls than boys in the western culture\textsuperscript{50}. If subjective health problems are induced by psychological stress, adolescent girls may be exposed to more stress than boys or boys may express stress in other ways. A marked increase in reported subjective health problems and less good perceived health have been reported between the age of 12 and 15 in previous studies\textsuperscript{46,51}, also seen in the young-hunt study (Appendix 6, fig 2.1). Early puberty and hormonal changes might pose a larger strain on girls. Also girls’ greater expectations about looks and appearance due to public pressure might be influential.
2.2.2 Respiratory health problems

Respiratory symptoms and bronchial asthma
Bronchial obstruction or bronchial asthma is one of the most common chronic diseases in children and adolescents in the developed countries. Severity varies from mild intermittent symptoms to life threatening attacks. There is no golden standard for defining bronchial asthma, and this is a problem in epidemiological studies when comparing time trends and prevalence between countries\textsuperscript{52,53}. Whether or not the prevalence of asthma is increasing has been debated for such reasons\textsuperscript{54-58}. Both defining asthma by assessing symptoms from questionnaires or measuring bronchial hyperactivity can introduce misclassifications. The main question defining asthma symptoms are wheezing and whistling in the chest. The term wheeze is difficult to translate in many languages and may be used as a term for a variety of noises and sensations. Population based studies have found that not all school children who report wheeze have asthma\textsuperscript{59,60}. The question of ever having asthma has been found to be sensitive for the diagnose of asthma in adults\textsuperscript{61}.

The International Study of Asthma and Allergies in Children (ISAAC) was initiated to standardize methodology in the research of bronchial asthma and allergies among children\textsuperscript{62}. A self-reported questionnaire was designed for 6-7 year olds and 13-14 year olds. No standardized questionnaire has been made especially for older adolescents. Using the ISAAC questionnaire, comparing different countries in different regions of the world, the prevalence differs greatly between different countries\textsuperscript{63}. The prevalence of wheeze the last 12 months ranged from 4.1-32.1\% and was particularly high in the English speaking countries and Latin America. The 12-month prevalence of wheeze in Sweden was 12.9\%. Norway was not included in the study since no study of the 13-14 years olds using the ISAAC questionnaire had been conducted at the time, but data from young-hunt, using the ISAAC questionnaire (Appendix 6, tab 2.2), are consistent with those of comparable countries.

Lung function
During the last three decades lung function tests have evolved from tools for physiologic studies to clinical tools widely used in assessing respiratory status. They have also become a part of routine health examinations in respiratory, occupational and sports medicine, and
are used in public health screening. Lung function tests give quantified measures of lung function, and provide direct assessments of airflow limitations. The most widely used lung function test is flow-volume spirometry. To maximize the value of spirometry both for clinical work and epidemiology, both American and European standardizations have been made\textsuperscript{64-68}. The standards of the American Thoracic Society (ATS) are commonly referred to in international epidemiological studies including flow-volume spirometry. Measures used in this thesis are:

- **Forced Vital Capacity (FVC):** maximal volume of air exhaled with maximally forced effort from a position of maximal inspiration. FVC is expressed in liters and reflects lung capacity.
- **Forced Expiratory Volume in one second (FEV1):** volume of exhaled air in the first second during the performance of FVC. FEV1 is expressed in liters, can be used as a measure of airflow limitation, and may reflect airway caliber.
- **Forced Expiratory Flow during the middle half of FVC (FEF50 or FEF25-75).** Expressed in liters per second. Reduced values are considered an expression of airflow limitation in the small airways.
- **FEV1/FVC:** The percentage of air expired in one second of the total expiration. Reduced values reflect airway limitation.

Both within individual (e.g. body and head position and effort) and between individual variations (e.g. aging, sex, size, race and past and present health) may affect these measures\textsuperscript{69}. Lung capacity increases with lung growth and development during childhood, and rises even more steeply with the growth spurt in adolescence\textsuperscript{69-71}. It shows an age related decline in adulthood.

Whether or not physical activity has an impact on lung function in adolescents and young adults remain uncertain. Some studies report a positive association between physical activity and physical fitness and forced vital capacity (FVC) and forced expiratory volume (FEV1) in young adults and adults\textsuperscript{72-75}, while others do not\textsuperscript{76}. If a positive association reflects a selection of people with larger lung function into physical activity or physical activity increases lung function is unclear. An impact of training on lung function in young
swimmers has been suggested, but other studies have found no effect of physical activity on lung growth.

Gender differences

Gender difference in respiratory symptoms may reflect differences in perception, reporting and interpretation of symptoms by the individual or professionals, but may also have a biological basis. Bronchial asthma is found to be more frequent among boys in childhood. This difference is wiped out through adolescence, and in adulthood more females than males are reported to have asthma. Both biological, social and cultural explanations have been discussed as reasons for this, including hormonal factors and greater denial of asthma symptoms in boys.

Sex differences are found in lung physiology. Female lungs are smaller than male lungs, and remain so throughout the life span. In adolescence, the age related increase in FVC ceases in girls as somatic growth ceases. Girls usually attain their maximal values of lung capacity at about 16 to 18 years of age. In boys vital capacity continues to increase after growth in height has ceased, and may not be maximal until the age of 20-25, probably due to continued maturation in boys with increase in muscle mass. The configuration of girls’ and women’s lungs is a results of proportional growth of airways in relation to parenchyma, while in boys and men the growth of airways lags behind that of the parenchyma. This dimensional advantage in females makes the emptying rate of the lungs higher in females than in males, reflected in larger expiratory flows and larger FEV1 to FVC ratios in girls than in boys of the same age and stature. Differences in impact of environmental factors on lung function remain uncertain.

2.3 Smoking and health problems

The health effects of cigarette smoking have been the subject of intensive investigation since the 1950s, and cigarette smoking has been linked to a wide range of health outcomes. Until recently, this research was mostly focused on adverse effects in adults. In adolescents, the long-term health consequences, those that emerge into adulthood, have been the subject of review. Current health problems, evident among young smokers, have
been investigated to a lesser extent. Many young people may have little fear of future disease. Current health problems are probably of greater interest, and might be more important in motivating adolescents not to start or to quit smoking.

2.3.1 Subjective health problems

Increased morbidity among smoking adolescents has been suggested by studies reporting more absence from school, poorer perceived health, and more frequent contact with health services \(^6,85-88\). Risk taking behavior, psychosocial problems and depression have also been associated with cigarette smoking in adolescents \(^6,89-92\). Studies that have addressed subjective health problems in teenagers, other than respiratory symptoms, most often group symptoms into nonspecific categories such as “psychosomatic” or “general illness” \(^6,85,86,88\). Focusing on different symptoms may be more useful in smoking prevention. The positive associations between smoking and drug abuse and alcohol intake seem well established \(^6,90\), but the use of medication by teenage smokers has received little attention.

2.3.2 Respiratory symptoms and lung function

Smoking is associated with increased respiratory morbidity in adults \(^3\), and many studies have linked smoking and respiratory symptoms in children and adolescents \(^6,17,93-95\). Smoking has been associated with increased frequency of wheezing and dyspnoe, as well as cough and phlegm.

Different studies have shown an increased risk of bronchial asthma in children exposed to passive smoking \(^96,97\), and own smoking has been related to higher risk of asthma in adolescence \(^98\). People with asthma are especially encouraged not to start or to stop smoking. Previous studies have found, however, that former asthma could be a risk factor for smoking initiation in youth \(^99\), and that adults with asthma had the same smoking habits as non-asthmatic \(^100\). They did not feel that smoking was an increased risk to them. In the
*young-hunt* study smoking in those who reported ever asthma was as frequent as for the total population (Appendix 6, tab 2.3)

Numerous cross-sectional studies of adults have shown lower levels of lung function in cigarette smokers, and longitudinal studies indicate that smoking speeds age-related decline in lung function in a dose related manner \(^3,71,101\). Also cross-sectional and longitudinal studies among children and adolescents show that smoking adversely affects lung function, indicated through reduced flow rates and slowed growth \(^6,93,95,101-103\). It has been suggested that the presence of wheeze in smokers is associated with higher risk of reduced levels of lung function \(^104\).

The mechanism by which smoking affects the lung is not entirely known. Studies have found a close link between smoking and inflammatory mediators in the small airways, and also suggest that smoking may cause an inflammatory process in the central airways and lung parenchyma \(^105\). This is in agreement with increased respiratory symptoms and changes in lung function associated with affection of the small airways in smokers. The characteristics of the inflammatory process have been reported to differ between smokers who develop chronic airflow limitation and those who do not \(^106\).

**Gender differences**

Smoking may affect male and female lungs differently \(^81,82\). Higher rates of wheeze and hyperresponsiveness in smoking females compared to males have been described and attributed, in part, to smaller airway caliber in females \(^82,93,107\). Also, because of smaller lung volume, a relatively higher dose of tobacco may be deposited in women than in men despite equal smoke burden. Hormones may alter response in females \(^82\), suggested because tracheal epithelium response to cigarette smoke has been shown to be related to the estrous cycle \(^108,109\). In adults, some studies suggest that smoking has greater impact on lung function in men \(^110-114\), while others report a more adverse effects in women \(^115-117\). This contradiction may reflect gender differences in smoking prevalence between populations \(^118\).
Only a few have focused on gender differences in studies of smoking and respiratory symptoms and lung function in adolescence. In one paper by Gold et al. 93 it was found that cigarette smoking was associated with mild airway obstruction and slowed growth of lung function in both sexes, but suggested that girls may be more vulnerable than boys to the effect of smoking on growth of lung function.

2.3.3 Physical fitness

Physical fitness is an important predictor of morbidity and mortality in different diseases in adulthood 119,120. An underlying premise for promotion of physical activity in youth is that it may persist through out adulthood, lead to a healthy lifestyle and thereby reduce the risk of behaviors that may be detrimental to health 121. Several cross-sectional studies have reported that physically active adolescents and adolescents who participate in sports are less likely to be regular smokers 6,122-124. Encouraging participation in sports has been widely recommended as smoking prevention, or as part of smoking cessation programs 6,124,125. Little attention has been paid to possible different smoking habits among participants of different types of sports.

2.3.4 Nicotine addiction

Nicotine addiction is not only the most common form of drug addiction, but also the one that causes most death and diseases 6. Most human research on nicotine addiction has been conducted on adults, but the basic biological processes that underlie this dependency appear to be similar in adolescents 6.

Studies have found nicotine to be as addictive as heroin, cocaine, and alcohol 126,127. The modern cigarette is a highly efficient drug delivery system, delivering nicotine in high concentrations rapidly into the brain 127,128. This situation optimizes the likelihood of self-administration. Nicotine acts on cholinergic receptors that show diversity in structure, function, and distribution in the nervous system, mediating the multiple actions of nicotine described in smokers.
Two medical disorders that relate to nicotine addiction have been identified: nicotine dependence and nicotine withdrawal. Results from different studies indicate that one to three out of five adolescent smokers are dependent on nicotine\textsuperscript{29}. Some groups of adolescents, as daily smokers, heavy smokers, and students in vocational schools, are found to have a higher risk of dependence\textsuperscript{29}. A large majority of adolescent smokers report withdrawal symptoms during attempts to quit or reduce their smoking\textsuperscript{29}.

Gender differences in dependence and withdrawal have been examined only in a few studies and with mixed results\textsuperscript{29}. Differences related to dependence have seldom been found and have not been consistent. However, girls have been found to have lower cotinine levels and report smoking fewer cigarettes per day than boys even though no difference in nicotine dependence prevalence rate was found\textsuperscript{129}. It may be that nicotine dependent women require fewer cigarettes than nicotine dependent men because of sex differences in metabolism of nicotine or differences in body weight. Findings related to withdrawal are more consistent, with girls smokers experiencing more appetite increase and more weight gain than boys\textsuperscript{29}. More stress has also been reported by girls after quitting, but at the same time girls have reported more positive effects of quitting\textsuperscript{29}.

2.4 Smoking prevention and smoking cessation strategies

Since the first publications on the impact of smoking on health, efforts to control smoking have been a primary public health goal. Efforts to control tobacco use among young people depend on stage of smoking initiation (Fig 2.1).
Smoking prevention has been recognized as a primary strategy for controlling smoking in the population. Advertising ban for cigarettes and counter advertising, educational efforts including school programs and mass media programs, increased cost of tobacco, tobacco restriction in public places, sales restriction for minors and social influences programs are all mass prevention strategies. The effectiveness of mass strategies is difficult to evaluate. Cochrane reviews of published papers show some evidence of effectiveness of mass media interventions and community interventions for preventing smoking in young people. Increased prices also seem to reduce cigarette smoking in youth. Tobacco advertising was banned in Norway in 1975. It is believed that the ban was effective because data from the National Council of Tobacco and Health showed that a more rapid decrease in adolescent smoking started from that same year, while the price on tobacco was stable in the period from 1975-81. However, the development of school educational programs was
also initiated during this period, and many studies have shown marked effect of such programs 6,132,133. Although both school educational programs, and community based tobacco control programs have been found effective, the long-term effects (more than 5 years) are questioned 134,135. Therefore follow-up programs seem important.

Once adolescents graduate to a given smoking status, return to earlier stages is uncommon 136. Adolescent smokers frequently try to quit, but are usually unsuccessful, despite an expressed desire to quit and repeated cutback attempts 137. They are difficult to recruit and retain in cessation programs and are not responsive to these programs 6. Also smoking cessation treatment for adolescents has been disappointing due to low participation and quit rates 138. Success in smoking cessation programs might require identification of appropriate target groups. Early intervention, before addiction, is also important.
3 Objectives

1. To study associations between smoking in adolescence and current health status by examining:

   • associations between daily smoking and current health problems, use of medication, and use of health services (Paper I).

   • gender specific effects of smoking and smoke burden on respiratory symptoms and lung function (Paper II).

   • the association between physical activity and participation in different sports and lung function in never smokers and daily smokers (Paper III).

2. To study factors that might be useful to smoking prevention and cessation programs in adolescence by examining:

   • the association between smoking habits and participation in different types of sports (Paper III).

   • individual and environmental differences between occasional and daily smokers (Paper IV).
4 Material and methods

4.1 The young-hunt study

4.1.1 Background

The young-hunt study is part of the Nord-Trøndelag Health Study, HUNT.

HUNT I
The first health survey in Nord-Trøndelag (HUNT I), Norway, was conducted in 1984-86. All the county’s inhabitants 20 years and older were invited, 75,000 people (88%) participated. The study was a collaboration between the National Institute of Public Health (Folkehetsla), the National Health Screening Service (SHUS), the University of Oslo, administrated by the Community Medicine Research Unit, Folkehetsla, Verdal, and focused on hypertension, diabetes, pulmonal diseases, and quality of life.

HUNT II
In 1995-97 the second health survey of Nord-Trøndelag (HUNT II) was carried out. Few large health studies had been carried out with adolescents so this time all inhabitants 13 years and older, 102 800 people, were invited, (73% of all participated). Main collaboraters in the study were the National Institute of Public Health (Folkehetsla), the National Health Screening Service (SHUS), the Norwegian University of Science and Technology, Trondheim (NTNU) and Nord-Trøndelag County Council, with the administration at the Community Medicine Research Unit, Folkehetsla, Verdal. Data were collected by self-reported questionnaires, physical examinations and blood samples (adult population). HUNT II was more extensive than HUNT I, and different national and international research centers are involved in more than 80 different research projects using these databases.

The youth part of HUNT II, defined as inhabitants aged 13-19 years, is called the young-hunt study. It was organized differently from the adult part and had its own administration. Young-hunt is a cross-sectional study of a total adolescent population.
4.1.2 Planning

Working groups
The first working group was established in 1992 with representatives from the National Institute of Public Health (Folkehelsa), Oslo and Verdal and the University of Oslo. This group started the discussion and planning of including adolescents in HUNT II. From 1994, this group was replaced by a local group in Nord-Trøndelag composed of representatives from the Nord-Trøndelag County Education Authorities, both teachers’ and school chiefs’ organizations, the Nord-Trøndelag Teaching College, the Nord-Trøndelag County Medical Authorities, Innherred Hospital, Levanger and Folkehelsa, Verdal. Plans were also discussed with the Norwegian Pediatric Organization, the Community Medicine Research Unit’s Research Advisory Board and other university research groups.

Information and consents of county and school authorities
Written information about the study together with an approval from the Nord-Trøndelag County Education Authorities, and the Medical Authorities, was sent to the County Chief Manager, the Chief Managers and School Chiefs in all the County’s communities and Principals of all the schools. All approved the study and 100% wanted participation for their community or school. Also the Child Health Care unit in every community received information.

4.1.3 Administration

The National Institute of Public Health, Community Medicine Research Unit, Verdal, was responsible for the planning, conducting and administration of the young-hunt study with Turid Lingaas Holmen as project leader. As part of the HUNT studies, young-hunt reported to the HUNT Steering Committee and the Community Medicine Research Unit’s Research Advisory Board.

Collaborators in different projects within the study included the National Institute of Public Health, Oslo (mental health and quality of life), Nord-Trøndelag Teaching College (physical activity and reading disorders), the Norwegian University of Science and Technology,
Trondheim (NTNU) (headache and asthma) and Innherred Hospital, Levanger (eating disorders).

The young-hunt study had its own budget and was funded by grants and support from the Norwegian Ministry of Social and Health Affairs, the Norwegian Research Council, Nord-Trøndelag County Council, the Norwegian University of Science and Technology, Trondheim (NTNU), the National Institute of Public Health, the Norwegian Women’s Public Health Association, and ASTRA ZENECAS AS.

4.1.4 Field work

The study was carried out in schools. Specially trained nurses visited all junior high and high schools in the county (65 schools) from September 1995 to June 1997. Two teams, each with two nurses, worked simultaneously, one in the northern and one in the southern part of the county.

Information routines

The principal of each school received written information about the study, consented to school participation, and appointed a contact person for the school. Representatives from the young-hunt study visited all high schools and the larger junior high schools to inform teachers. In addition, all teachers responsible for classes during the questionnaire administration received written instructions (Appendix 5).

Written information about the study was distributed to all students and parents well ahead of the study start (Appendix 3).
Courses for teachers and school health caretakers

Each six months, two courses, one in the north and one in the south, were held for teachers and school health caretakers in the communities participating in the study during that time. Topics were related to the study and included asthma and allergy, indoor climate, psychosocial problems, eating disorders, violence and addiction. Important were discussions about collaboration between schools and school health care.

4.1.5 Data collection

The data collection included a questionnaire, a physical examination, and an interview.

Questionnaire

A self-administered questionnaire (Appendix 1) was completed during one school hour, in a setting with no opportunity to view answers of the other students. The questionnaire was without name or registration number, only identifiable by a bar code of the 11-digit personal number (personnummer) by which all Norwegians are registered at birth. Each student put their completed questionnaire in a blank envelope and sealed it. Field workers collected the envelopes.

The questionnaire included topics on home environment, somatic and mental health, use of health services, stages of puberty, quality of life, physical activity, diet and eating habits and use of alcohol, tobacco and drugs. Youth in high schools (aged 16-19) answered one page of extra questions not presented for the younger age group. The young-hunt project leader, in collaboration with persons responsible for the substudies, constructed the questionnaire. Most questions had been previously used in national or international studies. Some questions were made for this study. A pilot study, testing the questionnaire, was carried out in Sør-Trøndelag county, including two classes of eight grade (14-15 years) in junior high schools and the second year (17-18 years) of high school.
Physical examination
Within a month after completing the questionnaire, all participants had a physical examination performed by the trained project nurses. The nurses visited every school, bringing the equipment. Height, sitting height, weight, hip/waist ratio, blood pressure and lung function were measured. All measurements had standardized (written) procedures. Tape measures and weights were adjusted against standards. All students received written test results of blood pressure and lung function measures explaining the meaning of the test. If necessary, they were advised to contact the school health care or a doctor.

Interview
In connection with all examinations, the nurses conducted two structured interviews, one on headache and one on allergy and respiratory symptoms, including triggers, medication, pet keeping and smoking habits. The questions had written procedures on interpretations.

4.1.6 Quality controls
All field workers were specially trained in examination and interview techniques before entering the study. Meetings with all the field workers were held every month in the study period. Examination techniques, possible interpretations of questions in the interviews, practices and experiences were discussed. The nurses regularly listened to each other during examinations comparing techniques and interpretations. The project leader and research technician also visited the teams during work and had regular telephone contact.

Weekly, monthly and 6 months working plans were written. Routines were checked and discussed weekly. Quality control routines were followed during data punching and results checked regularly.
4.1.7 Ethics

Each adolescent signed a written consent to participate in the study (Appendix 4). The consent contained information on the study and use of data, the same information as distributed to the adolescents ahead of the study to be discussed with parents. Parents of students younger than 16 years also gave their written consent (Appendix 4). The Regional Committee for Ethics in Medical Research and the Norwegian Data Inspectorate approved the study.

4.1.8 Participation

The target group for the young-hunt study was all inhabitants in Nord-Trøndelag county aged 13 to 19 during the study years. As the study followed the school year instead of the calendar year, two sources were used for invitations:

- The list of students in the age group registered in schools (klasselister) obtained from each school; “Youth registered in school”.

- The list of adolescents in the age group not registered in any school, obtained from the “the follow-up service” (Oppfølgningsetaten) of the County Education Authorities; “Youth not registered in school”.

Since adolescents usually graduate from high school the calendar year they become 19, about half of the 19 year olds had left school and were not invited. Some 12 years old (126 adolescents) who were in junior high schools and also a few who had turned 20 in high schools before the study started at their school, participated (40 adolescents). Totally 9,917 adolescents were registered as invited to the study, and 9,131 (92.1%) participated (Table 4.1).
Table 4.1. Adolescents who were invited and who participated in the *young-hunt* study.

<table>
<thead>
<tr>
<th>Schools</th>
<th>Number invited</th>
<th>Total participation; participants with questionnaire and/or examination</th>
<th>Participants with questionnaire</th>
<th>Participants with both questionnaire and examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Junior high</td>
<td>5,004</td>
<td>4,784 (95.6)</td>
<td>4,743 (94.8)</td>
<td>4,598 (91.9)</td>
</tr>
<tr>
<td>Senior high</td>
<td>4,913</td>
<td>4,313 (87.8)</td>
<td>4,207 (85.6)</td>
<td>3,810 (77.5)</td>
</tr>
<tr>
<td>&quot;Not in school&quot;</td>
<td>285</td>
<td>34 (12.0)</td>
<td>34 (12.0)</td>
<td>31 (10.9)</td>
</tr>
<tr>
<td>Total</td>
<td>9,917</td>
<td>9,131 (92.1)</td>
<td>8,984 (90.6)</td>
<td>8,439 (85.1)</td>
</tr>
</tbody>
</table>

4.2 Material used in Papers I-IV (fig. 4.1)

The study population presented in this thesis consists of adolescents, aged 13 –18 years, who attended school. We chose to exclude the 19 year olds because about half of the 19 year olds had already graduated from school and were not invited. Those aged 12 and 20 who had participated were also excluded (see also chapter 6.1.2.1).

Adolescents who participated in the questionnaire were included in Papers I and IV. The number of participants in these two papers differs. Questionnaires from 420 adolescents were added after another quality check. This was after Paper I had been accepted for publication. The results were not changed when the analyses in Paper I were repeated including all adolescents. Participants both in the questionnaire and with spirometry were included in Papers II and III.
Figure 4.1. The study populations used in the different papers in the thesis.

Total number of participants in the *young-hunt* study:
\[ n = 9,131 \]

Participants 13-18 years old:
\[ n = 8,594 \]

Participants who answered the questionnaire:
\[ n = 8,460^* \]
(Paper I and Paper IV)

Participants who had never had asthma and had acceptable spirometry curves:
\[ n = 6,811 \]
(Paper II and Paper III)

* Only 8,040 were included in Paper I (see chp. 4.2).

### 4.3 Variables used in Papers I-IV

The variables used in Paper I-IV, with one exception (collected from the interview on asthma and allergy), are collected from the questionnaire and the lung function testing. Definitions, groupings of variables, dichotomization of questions with more than two answering alternatives and the question from the interview are shown in Appendix 2 and in each Paper.
4.3.1 Smoking habits (Appendix 1, q 40-44)

The question about having tried smoking (q 41) was from the “WHO cross-national survey of health behavior in school aged children” \textsuperscript{139}, previously used in Norway. The questions used on smoking habits (q 42) were modified from the questions used in the a study of Norwegian teenagers “Ung i Norge” and in “UNGdata”, NOVA, (www.isaf.no/ungdata/). The questions on age of smoking initiation and duration of smoking are the same as in the adult HUNT study. Definitions are shown in Appendix 2.

4.3.2 Lung function

Spirometry was performed by specially trained nurses, in accordance with American Thoracic Society (ATS) standards \textsuperscript{64}, using computerized pneumotachographs (Jaeger Masterscope, software version 4.15, Jaeger Inc, Wurtzberg, Germany). Pneumotachographs were calibrated twice daily with one-liter syringe. In addition, they were calibrated if changes were made (e.g. changes of filter with excessive salivation). The nurses also performed a biologic control assessing their own lung function each day. The participants were seated and extension or flexion of the neck was avoided. Nose-clip was used. Altitude, barometer pressure, temperature and relative humidity were registered every morning. Temperature was also registered in the afternoon. For the results, the software carried out automatic conversion from ambient temperature pressure (ATP) to body temperature pressure saturated (BTPS). The software satisfied the ATS equipment recommendations.

The test maneuver should be performed with maximal effort to assure best values of FEV1 and FEF50, and last until all the air is emptied to assure maximal value of FVC. Acceptability of flow volume curves was based on the recommendation of ATS from 1987 \textsuperscript{64}. A minimum of three acceptable maneuvers was performed. If maneuvers were not satisfactory a maximum of the five was done. The flow-volume curve with the highest sum of FVC and FEV1 was saved. Computerized error messages were shown during testing if one or more of the following ATS recommendations were not met:
- Duration of expiration should be 6 seconds or more (expiration time)
- The difference between the FVC and FEV1 in the two best tests should be less than 5% or 100 ml (reproducibility)
- The back extrapolated volume should be less than 5% or 100 ml (start of test)
- An obvious plateau of at least 2 seconds at the end of test.

The field workers were specially trained in performance of spirometry and in assessing acceptability of curves. The acceptability of spirometry results was assessed both during the testing and during the data analysis, and included review of the computerized ATS error codes reported from the Masterscopes, and visual inspection of volume/time and flow/volume graphics. The computer provided feedback to the technicians on acceptability by providing the ATS error codes. In addition to the ATS error codes, they were instructed to inspect the flow-volume curves to ensure that the tested youth produced the highest possible peak flow, without cough, leakage of air or early termination. In adolescents who were unable to sustain expirations for 6 seconds or more before triggering automated cessation of collection of spirometry data, achieving end-of-test acceptability was confirmed either from the computerized error code regarding flow plateaus or from visual inspection of spirometry displays during testing. In addition to inspecting the curves, effort was also considered during analyses using PEF/FEF50 equal or higher than 1.25 as an acceptable effort (Clausen J, personal communication).

One person (the project leader), who had nearly 20 years experience with lung function testing, instructed all. Instructions were repeated regularly during the study, and curves were viewed by the project leader and discussed with the field workers.

Forced vital capacity (FVC), forced expiratory volume in one second (FEV1), mid forced expiratory flow (FEF50) and FEV1 percent in relation to FVC (FEV1/FVC) were registered. FVC was defined as the largest of either forced expiratory or forced inspiratory vital capacity from technically acceptable curves. The reported FEV1 was the largest value from technically acceptable curves.
4.3.3 Physical activity (Appendix 1, q 50, 53-56)

Physical activity was assessed by frequency of exercise using a question from the “WHO cross-national survey of health behavior in school aged children” (q50) 139. Frequency of exercise was divided into three levels (Appendix 2).

The questions about different types of sports and participation in organized activities and competitions (q 53-56) had not previously been used in other studies. Different sports were divided into five groups: “Individual high endurance sports”, “Individual low endurance sports”, “Swimming”, “Bodybuilding and fight sports” and “Team sports” (Appendix 2).

4.3.4 Health problems, medication and health services
(Appendix 1, q 10-12, 14,15,19-21,28,29,34,36-39,63,66, 93-98)

The questions about perceived health and disabilities (q10, 11) have previously been used in adult HUNT. Subjective health problems (q12), allergy (q34, 36) sleeping problems (q63), medication (q37) and use of health services (q93-98) are similar to questions used in other studies, but especially designed for the young-hunt study. The more frequent health problems were dichotomized differently from the less frequent problems (Appendix 2). Questions of respiratory symptoms were standardized questions from the ISAAC questionnaire, translated according to the ISAAC protocol 62. The term wheeze can not be directly translated to Norwegian, therefore terms most frequently used by youth with bronchial obstruction when describing their symptoms were used 140.

Acute bronchitis were defined as “Yes” to the question “Do you have a cold with cough or do you have bronchitis today” from the interview during the clinical examination.

Except for allergy and respiratory disease, the number of students who reported any chronic disease was small (q 38 and 39). Diabetes, epilepsy, heart disease, rheumatism, bowel disease, cancer, kidney disease, and skeletal disease were therefore combined into one variable called “chronic disease”.

39
4.3.5 Social factors (Appendix 1, q 2,3,67,68,71,84,87)

These questions were partly adopted from the “Ung i Norge” study (NOVA) and partly designed for the young-hunt study. Divorced parents, mother/father/sibling’s smoking and seen parents drunk were considered as “environmental factors”, while education, perceived health, out with friends, homework, watching TV, organized activity and sports, physical exercise and drunkenness were considered as “individual factors” (Appendix 2).

4.4 Statistical methods

Independent Samples t-tests were used for comparisons between boys and girls regarding initiation age of smoking, number of cigarettes smoked, years of daily smoking and numbers of pack years.

Chi-square and Odds Ratio (OR) were used to study significance and strength of associations between smoking habits and health variables (Paper I) and social factors (Paper IV). Fisher’s exact test was used when one cell had an expected frequency of less than five. Because of multiple comparisons, significance was set at p < 0.01, but 95% Confidence Intervals (CI) were shown in the tables. The analyses were stratified according to age and sex.

Logistic regression was performed to estimate independent importance of social factors (Paper IV), and effects of smoking habits on respiratory symptoms (Paper II) and sports (Paper III). Odds Ratio with 95% confidence intervals were calculated from the regression models. Significance of sex differences in associations between smoking habits and respiratory symptoms (Paper II) was tested adding sex and smoking interaction to the model.

Linear regression models were used to compare lung function and smoking habits and physical activity, with FVC, FEV1, FEF50 and FEV1/FVC as dependent variables in separate models (Papers II and III). Age, height, weight, passive smoking, rhinitis, current
bronchitis and physical exercise (Paper II and comparing types of sports in Paper III) were
adjusted for. All models were sex specific. Daily smokers and never smokers were
analyzed separately in Paper III.

Model assumptions was tested in each model by histogram (frequencies against regression
standardized residuals), P-P plots for regression (expected cumulative probability against
observed cumulative probability) and scatter plots for regression (unstandardized residuals
against the different variables). The assumptions tested were linearity (mean of dependant
variable (Y) is a linear function of X), normality (normal distribution of Y for each
predictor variable X) and homoscedasticity (variability of Y, as assessed by variance or
standard error is the same for all Xs). Variables tested in the models were age, height and
weight. The assumption of homoscedasticity was not met for height (fig 4.1). Logarithmic
(ln) transformation of lung function (Y) was used to fit model assumptions. Age was not
strictly linearly correlated to FEV1 in boys, but age squared did not improve the model.
Height was linearly correlated to the logarithmic (ln) transformation of FVC, FEV1 and
FEF50 at all ages.

Analyses of variance were used for comparisons between mean values of lung function
measures of different smoking burdens and different levels of physical activity with age,
height, weight, passive smoking, rhinitis, current bronchitis and physical activity as
covariates. Boys and girls were analyzed separately, and in Paper III daily smokers and
never smokers were also tested separately.

Estimates with confidence intervals for smoking effects and effects of physical activity on
lung function were expressed as percent differences, calculated from the logarithmic scale,
with never smokers as reference in Paper II, and those who exercised one day a week or
less as reference in Paper III. Since the value of the betas was less than 0.1 the percentage
was derived using the actual betas multiplied by 100. With values of beta closer to one, the
correct formula would have been $e^{\beta_{-1}}$.

SPSS Base 8.0 for Windows (SPSS Inc. Illinois, US) was used for all analyses.
Figure 4.1 Testing the assumption of homoscedasticity; scatter plots for regression of FVC and height in boys before (left) and after (right) ln transformation in the linear regression models used in Papers II and III.
5  Review of Paper I-IV

5.1  Paper I


The Nord-Trøndelag Health Study
Turid Lingaa Holmen, Elizabeth Barrett-Connor, Jostein Holmen, Leif Bjermer

Background and aims: Increased morbidity among smoking teenagers has been reported, but specific current health problems and medication use other than narcotics have received less attention. The aim of this study was to examine the association between subsequent health problems and daily smoking in teenagers.

Method: 90% of all teenagers attending junior high or high schools participated in a cross-sectional study, conducted in Nord-Trøndelag County, Norway, 1995-97, including 8,040 students, 13-18 years. Information on smoking habits, health problems, medication use, and use of health services was obtained in schools by self-administered questionnaire and by interview.

Results: Fifty-five percent of boys and 57% of girls had tried smoking, and 9% and 11%, respectively, reported current daily smoking. Compared to boys and girls who had never smoked, daily smoking in both sexes and all age groups was associated with significantly poorer perceived health, respiratory symptoms, headache, neck and shoulder pain, stomachache, nausea, frequent heart beats, nervousness/restlessness and sleep problems. Daily smokers used more medications and health services.

Conclusions: Daily smoking by adolescents is already associated with specific health problems. Whether or not the association is causal, daily smoking identifies a group of adolescents with health problems, for whom preventive strategies should also imply medical and social support.
5.2 Paper II

Gender differences in the impact of adolescent smoking on lung function and respiratory symptoms. The Nord-Trøndelag Health Study, Norway, 1995-97
Turid Lingaas Holmen, Elizabeth Barrett-Connor, Jack Clausen, Arnulf Langhammer, Jostein Holmen, Leif Bjørner (Submitted)

Background and aims: Smoking may increase respiratory symptoms and adversely affect lung function in adolescents. Girls take up smoking at least as frequently as boys. If girls are more vulnerable to impact of smoking, morbidity and mortality related to smoking could increase. Sex specific impact of smoking needs evaluation.

Method: All students in junior high and high schools in Nord-Trøndelag County, Norway, 1995-97, were invited to a cross-sectional study. Information on smoking habits and respiratory symptoms was obtained by self-administered questionnaire. Spirometry was performed by specially trained nurses in accord with ATS standards.

Results: 8,305 students (83%) completed both questionnaire and spirometry. Among the 6,811 students aged 13-18 years (50.3% girls), with no history of asthma, 2,993 (44%) reported never smoking, 665 (9.8%) reported occasional smoking and 677 (9.9%) reported daily smoking; mean initiation age: 13.9 years. Smoking was more common in girls, but boys smoked more daily cigarettes and reported more pack years of smoking. In all smoking categories, including occasional smokers, smokers reported a higher prevalence of respiratory symptoms than non-smokers. Symptoms increased with smoke burden. Compared to boys, girls reported more respiratory symptoms and greater increase in symptoms with comparable smoke burdens. A dose-response relation between smoking and reduced levels of lung function was found in girls only. Both boys and girls with light smoke burden had higher lung capacity (FVC) than never smokers.

Conclusion: Girls were more vulnerable than boys to the impact of smoking on both respiratory symptoms and lung function.
5.3 Paper III


Turid Lingaas Holmen, Elizabeth Barrett-Connor, Jack Clausen, Jostein Holmen, Leif Bjermer

(Accepted for publication in Eur Respir J)

**Background and aims:** Sport participation has been encouraged in smoking cessation programs. We studied the association between smoking habits and physical activity, particularly participation in different types of sports and lung function.

**Method:** All students, 13–19 years, in Nord-Trøndelag County, Norway, 1995-97, were invited to a cross-sectional study. Information on smoking habits and physical activity was obtained by self-administered questionnaire. Spirometry was performed in accord with ATS standards.

**Results:** 8,305 (83%) completed both questionnaire and spirometry. 6,811 (49.7% boys), aged 13-18, without asthma were included in this paper. Of these, 2,993 (44%) reported never smoking, and 1,342 (19.7%) reported current smoking (9.8% daily). Overall, frequency of physical exercise was inversely associated with smoking, but students who participated or had participated in individual low endurance sports, swimming, bodybuilding, or fighting sports were significantly more likely to be daily smokers than those who did not participate in these sports. Both daily smokers (53%) and occasional smokers (43%) were more likely to have quit sports than never smokers (26%). In never smokers, a positive dose response was found between physical exercise and better lung function (FVC and FEV1) in both boys and girls; no similar significant dose response relation was seen among daily smokers.

**Conclusions:** These data suggest that smoking habits in different types of sports should be considered when promoting physical activity as smoking prevention, and sports organizations should include smoking prevention programs. Adolescents with better lung function may self-select into sports; this possibility needs to be studied in a longitudinal design.
5.4 Paper IV

Adolescent occasional smokers, a target group for smoking cessation?

_The Nord-Trøndelag Health Study, Norway, 1995-97_

Turid Lingaas Holmen, Elizabeth Barrett-Connor, Jostein Holmen, Leif Bjørner.

**Background and aims:** Adolescent smokers are often unsuccessful in quitting and difficult to retain in cessation programs. In health promotion, focusing on the right target groups is essential. The aim of this study was to examine if adolescent occasional smokers differ from daily smokers, and if possible differences could be useful for targeted smoking cessation programs.

**Methods:** 91% of all teenagers attending junior high or high schools participated in a cross-sectional study, conducted in Nord-Trøndelag County, Norway, 1995-97, including 8,460 students 13-18 years old. Information on smoking habits, education, after school activities and parental status was obtained by self-administrated questionnaires.

**Results:** 54% of boys and 57% of girls had tried at least one cigarette. Of these, 36% of boys and 41% of girls were current smokers, half of whom reported occasional smoking. Students who had quit smoking had more often been occasional than daily smokers. Compared to daily smokers, occasional smokers participated in higher academic courses, were more engaged in organized activities and sports, had been less drunk and had better family role models.

**Conclusion:** These findings support potential utility of focusing on occasional smokers as a special target group in smoking cessation programs, and suggest that smoking cessation programs for occasional smokers may need a different focus than programs for daily smokers.
6 General discussion

6.1 Methodological considerations

In an epidemiological study accuracy in estimation is an overall goal. To achieve this the study should be designed and conducted with the aim of reducing random and systematic errors. Precision in measurement and estimation correspond to reduction of random errors, while validity of a study corresponds to lack of systematic errors. Validity is usually divided into two parts: internal validity and external validity.

6.1.1 Precision

One major problem in applying results drawn from a sample to the total population is that the play of chance may always affect the results observed because of random variations between samples. Whether or not there is a sampling error when a total population is studied is argued. According to professor Rothman it should be standard practice to treat all epidemiological studies, also cohort studies, as having sampling errors. Other sources such as the measurements of key variables also contribute to the overall inaccuracy. Precision can be increased by increasing the size of a study or by improving the design to increase efficiency. The degree to which chance or random errors may account for the results can be evaluated by tests of statistical significance.

The young-hunt study was designed to include the total teenage population in Nord-Trøndelag County. The response rate was high, and the sample size quite large for this age group, indicating precise estimates. However, the events of some of the key variables were not common, and this reduced the statistical power. This was so for daily smokers in the younger age groups and for the higher levels of pack years in all age groups. Rare events also applied to some health problems, to medication used and to participation in some type of sports. This would tend to diminish the significance of associations giving a type II error. Significance found in spite of this indicates strong associations. Lack of power is reflected in broad confidence intervals for these variables in Papers I-IV. A type II error cannot be excluded when
no significant association was found between the highest levels of smoke burden and reduced lung function in boys (Paper II), and when no significant association was found between lung function and frequency of physical activity in smokers (Paper III). This is discussed in the papers.

6.1.2 Internal validity

Internal validity is defined as the degree to which the results of an observation are representative for the particular group of people being studied\(^\text{144}\). Three general types of biases can reduce internal validity: selection bias, information bias and confounding\(^\text{143}\).

6.1.2.1 Selection of subjects and study participation (selection bias):

The target group of the young-hunt study was all inhabitants in the county aged 13–19 years. As described in chapter 4.1.8, two sources were used for invitations, defining two separate groups: "Youth registered in schools" and "Youth not registered in schools".

Since the 19 year olds who had graduated from school were not invited, the total attendance rate of the 19 year olds were low. It might not be expected that those who had already graduated from school would yield a systematic bias, but we excluded the 19 years olds in the papers because they were few. The 12 year olds and 20 year olds who were registered in the study were also excluded because they were not the target group of the study and because they were few.

"Youth registered in school"
Youth not participating were mostly not in school on the day of the study, did not get consent to participate from their parents (less than 1% in the age group 13-15) or did not want to participate. Some were unable to participate because of disabilities. The exact number of such disabled students was not registered, but the number was low. The high response rate indicates that the study cohort represents the population fairly well, and that no serious selection bias is present. However, it is possible that students absent from school generally might have had
more health problems than responders. If in addition, they were more frequently never
smokers, this could weaken the association between daily smokers and current health problems
reported in Paper I. However, compared to responders, non-responders are more likely
smokers\textsuperscript{107,145-147}. Associations could also be reduced if there were more healthy daily
smokers (Paper I) or more physical active daily smokers (Paper III) among non-responders, but
this seems unlikely. More smokers in the non-responder group would tend to strengthen the
associations.

"Youth registered as not in school"
Since no one was registered as not in school in the age group attending junior high schools
(13-16 years), this problem only applied to the age group 16-19 years.

Only adolescents in 13 of the county's 24 municipals (285 youths) were invited from this
group because the lack of resources. The response rate was very low, 12\% (tab 4.1). 7\% replied
that they were attending other schools or were not living in the county, and another 7\% replied
that they did not want to participate. The lists obtained from the school authorities were also
lacking information, for example, it was uncertain how many occupational trainees who were
registered. The internal validity cannot be expected to be satisfactory within this group in the
young-hunt study. As less education is known to be associated with more smoking and other
health related factors\textsuperscript{6}, also discussed in Paper I, non-responders from the group of youth not
in school could be expected to strengthen the associations found in all the papers.

6.1.2.2 Self reported information (Information bias)

All self-reported information may be influenced by the veracity of the responders.

Smoking habits
Risk taking health behaviors, such as smoking habits, can be especially vulnerable to
truthful reporting in adolescence. It is at the same time considered non-acceptable among
most guardians, but may in many peer environments be considered as "cool", an admirable
habit. The questions about smoking habits that were used have not been validated.
However, some features in the study design foster truthful reporting. Confidentiality was stressed and no names were attached to the questionnaire. Smoking habits were not the focus of the study and were included with a variety of other items. Self-reported smoking habits have been found to be reliable in young adults in Norway, and also others suggest accurate reporting by adolescent daily smokers and non-smokers.\textsuperscript{136,148}

In the \textit{young-hunt} study the participants were also interviewed about smoking habits (Appendix 2). The questions were not identical, but answers were compared to the answers given in the questionnaire (Table 6.1). Non-smoking students registered as smokers or students with a higher smoking level from the questionnaire to the interview may reflect the time difference between the two settings. Only seven of those who reported that they never had tried smoking in the questionnaire were registered as smokers in the interview (none as daily smokers). The agreement between the answers in the questionnaire and the interview was also good for daily smokers, 98% of daily smokers in the interview also reported smoking in the questionnaire. The agreement was not good for occasional smokers. About half of those who reported occasional smoking in the questionnaire said they were non-smokers in the interview. This might be due to different interpretation by the students and the project nurses of occasional smoking, but was more likely an under reporting of occasional smoking in the interview. Under reporting may be due to differences in questions or reluctance to report smoking in the interview. Also other studies have shown that occasional smokers might be misclassified as non-smokers, while self-reported daily smoking and non-smoking are reliably reported.\textsuperscript{136}

Considering this information, the data on smoking habits used in Papers I-IV are from the questionnaire.
Table 6.1. Comparisons between smoking habits reported in the questionnaire and in the interview among adolescents, 13-18 years, in the *young-hunt* study.

<table>
<thead>
<tr>
<th>Smoking habits in the questionnaire</th>
<th>Smoking habits in the interview</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non smokers</td>
</tr>
<tr>
<td>Never tried smoking, not one cigarette</td>
<td>3,447 (99.8 %)</td>
</tr>
<tr>
<td>Tried smoking, but were non smokers</td>
<td>2,075 (98.7 %)</td>
</tr>
<tr>
<td>Previous smokers</td>
<td>441 (84.6 %)</td>
</tr>
<tr>
<td>Occasional smokers</td>
<td>393 (51.8 %)</td>
</tr>
<tr>
<td>Daily smokers</td>
<td>45 (5.6 %)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,401 (83.8 %)</td>
</tr>
</tbody>
</table>

Smoking data were missing for 253 students.

**Health problems and physical activity**

Health outcomes cannot be expected to be equivalent with diagnosed illness, but the students’ subjective feelings of health problems may be just as relevant. Information bias related to smokers reporting more health problems because they know smoking is harmful cannot be excluded. However, questions on health problems were answered before questions on smoking, reducing the possibility of differential misclassification. Validity is supported by the consistency in the reporting of health problems, medication use and use of health services. These questions were also placed in different sections of the questionnaire.

It cannot be excluded that students participating in some sports reported less smoking because they felt that smoking was not accepted by sportsmen, or wrongly reported smoking because smoking was considered to be “cool” by participants in that sport. Questions on sport activities were also placed after, and far from, the questions on smoking.
Implications for the results in Papers I-IV

*Paper I:* Since daily smokers reported more school absence and more health problems compared to never smokers, any misclassifications of smokers would have tended to reduce smoking-symptom associations (bias towards the null value). Smokers who wrongly reported health problems would strengthen the associations, but the study design and consistency in reporting make this less likely.

*Paper II:* Any misclassification of smokers and smoke burden would tend to reduce associations between smoking and lung function. However, the gender differences could be affected if misclassifications of daily versus never smokers were higher in boys than in girls. Since boys were heavier smokers than girls, consistent with other studies in different countries, this would imply that never smoking boys to a larger extend wrongly reported daily smoking and daily smoking boys more often reported an excessive amount of smoking. Although we cannot exclude this, it seem unlikely as never smokers are seldom found to report daily smoking in any sex, and an under reporting of amount of cigarettes is more likely than over reporting.

The associations would be strengthened if youth with reduced lung function for other reasons wrongly reported smoking. This is not likely, and is also contradicted by the finding that smokers with low smoke burden had larger lung capacity than never smokers.

*Paper III:* Misclassification of smokers would tend to reduce associations with physical activity. The associations could be exaggerated if smokers wrongly reported less physical activity. Consistency with other studies makes this seem unlikely. It is also unlikely that never smokers wrongly reported smoking associated with some sports.

*Paper IV:* Only never smokers wrongly reporting occasional smoking could be expected to increase differences between occasional and daily smokers. Comparing the questionnaire and the interview in the young-hunt study, and findings from other studies make this unlikely.

The consistency of prevalence and gender differences with results from other studies of adolescent smoking also support the validity of the present results.
6.1.2.3 Lung function (Information bias)

Spirometry is an effort-dependent maneuver with many possibilities of influencing internal validity. It requires careful subject instruction, understanding, coordination and cooperation. This in turn makes the interaction between technician and the person tested crucial for a good result. Other within individual variations are body position, head position and circadian rhythms\(^{69}\). Standardized procedures, checking of the equipment, carefully training of project nurses and quality control were practiced in the young-hunt study to minimize differences between participants and between project nurses. Spirometry was conducted during school hours making influence of circadian rhythms less important.

**Acceptability of spirometry measures**
Flow-volume curves of all students with FVC higher or equal to 150% of predicted, and FEV\(_1\) higher or equal to 140% or less or equal to 70% were inspected, and not acceptable curves (n=56) were excluded.

Most adolescents were unable to sustain expirations for 6 seconds or more before triggering automated cessation of collection of spirometry data. The mean expiratory time registered was 3.7 seconds in boys and 3.4 seconds in girls. It is well accepted that youth empty their lungs faster than adults\(^{64,68,149}\). Compared to predicted values for adolescence programmed in the computers (prediction equations by Zapletal et al.\(^{65}\)), mean FVC was 102.3% in boys and 104.7% in girls. This supports sufficient expiration time.

Studies in adults have reported that up to one forth of the subjects studied do not meet the ATS 87 recommendations\(^{150}\). This is consistent with failures to meet the recommendations (other than expiration time of 6 seconds) in the young-hunt study. It is acknowledged in the ATS recommendations that they are difficult to meet, especially in children and adolescents, and it is not advised to exclude subjects not meeting the expiration time and reproducibility criteria, or subjects with sub maximal efforts (Clausen J, personal communication)\(^{64,68,149,151}\). The recommendations on lung function testing from the European Respiratory Society and the American Thoracic Society are now in the process of being reviewed\(^{152}\).
Implication for the results (Papers II and III)

Since light smokers and physically active youth were found to have better lung capacity than never smokers and the physically less active youth, a systematic error would occur if smokers and physical active youths were more able to produce acceptable curves. Daily smokers had a higher average forced expiratory time (FET) than those who had never tried smoking (3.3 vs 3.1, p=0.01 in boys and 3.3 vs 2.7, p <0.001 in girls). If this was due to daily smokers being able to empty their lungs better than never smokers, it might have accounted for the larger values of FVC. However, longer expiration time is also associated with bronchial obstruction of the smaller airways. As smokers reported more respiratory symptoms, more unrecognized bronchial obstruction could be a plausible reason for longer expiration time. After adjustment for FET, FVC in occasional smoking girls was barely no longer significantly higher compared to never smokers (p=0.07), other results reported in the Papers were not changed. No significant difference was found between mean expiratory time in physical active youth compared to those who were less physical active.

All students with curves accepted during testing were included in the analyses, regardless of error codes registered in the Jaeger Masterscope. However, the analyses in Paper II and III were also done after excluding students with different error codes and low effort (PEF/FEF50 <1.25). This did not materially change the results.

6.1.2.4 Confounding factors

Confounding occurs when the effects of risk factors have not been separated and it is therefore incorrectly concluded that the effect is due to one rather than the other variable. A confounder must be a risk factor for the outcome, and also associated with the exposure, but should not be an intermediate step in the causal path between exposure and outcome.
Several methods are available to control confounding, either through study design or analysis of results. Confounding factors were considered in the statistical analyses in the papers included in this thesis. When multivariate models were used, variables included in the models were previously described risk factors for smoking, respiratory symptoms and lung function. Boys and girls were analyzed separately. Adolescents with known asthma were excluded from the analysis.

Socioeconomic status may be negatively associated with cigarette smoking, physical activity and health. Questions about economic and educational status of the parents were not included in the young-hunt study, and could not be adjusted for in the analyses. Other studies including socioeconomic status have found an independent association between smoking and health problems and physical activity. Smoking habits and lung function are associated with race. Number of students of other races than Caucasian registered in the study was so few (3 blacks and 13 Asian) that this could not influence the results.

6.1.3 External validation

External validity or generalizability is the extent to which the results of a study apply to people not in it. Determining the validity of a generalization is ultimately a matter of informed judgment.

The large number of participants and high participation rate supports a high external validity of the study population of 13-18 years old in the county. Nord-Trøndelag has a sex and age distribution similar to Norway as a whole. The same is true for geography, industry, sources of income and economy. The county lacks large cities and the levels of average education and income are also somewhat lower than the average of the country. This may affect prevalence of smoking. Prevalence of smoking in Nord-Trøndelag, both in adults and adolescents, has been found to be somewhat lower than the national mean. The lower values for occasional smoking seen in the young-hunt study compared to those from the National Council of Tobacco and Health may also be due to differences in the phrasing of the questions. It is unlikely that the associations would be effected by higher prevalence of smoking. The results...
are judged also to have international generalizability to people of similar race and culture. Consistency with findings in previous studies supports both nationally and internationally generalizability.6,10,13,93.

6.2 Importance of results and implications

Smoking and health

Paper I is one of few papers that have reported associations between daily smoking and multiple current somatic and psychosocial health problems, and the use of medication in adolescents. As discussed in the paper, causality cannot be assumed from this cross-sectional study. Smoking itself may cause some symptoms3,6,88,94, but other symptoms could be the result of stressful life situations that may lead to smoking6,49,86,89,91. If smoking is the cause of presented health problems, the young age and short duration of daily smoking (mean 1.6 years) call for concern.

That adolescent girls may be more vulnerable than boys to the effects of the same smoke burden on lung function has not been previously published (Paper II). The greater increase in symptoms per level of smoke burden in girls, also found in adults107, confirms that females are more susceptible to changes in bronchial reactivity due to smoking. If girls now smoke more or at least as frequent as boys do, morbidity and mortality of cigarette smoking will increase in the years to come.

The dose response increase in respiratory symptoms seen in both boys and girls (Paper II) indicates that smoking has an early impact on respiratory function also in boys and that symptoms precede changes in lung function. This supports the importance of being aware of health problems in young smokers, also lung function, especially in daily smoking girls.

The larger lung capacity found in light smokers compared to never smokers (Paper II) has also been reported by others93,159,160, but not given much attention. These findings are important to account for when examining effects of smoking on lung function in adolescents, and may be one reason for contradictory result reported in different studies6.
Why young light smokers might have larger lung capacity than non-smokers is not known. Longitudinal studies have indicated that it is those with a larger lung capacity who take up smoking. They suggest that those with larger lung capacity do not feel the same discomfort when they try smoking for the first time. Discomfort does not seem to explain the difference in the young-hunt study because smokers were compared to those who had never tried smoking. Another reason may well be that adolescents who take up smoking are more developed than never smokers, and that stage of puberty affects lung function in addition to age and height. These questions need more attention.

Whether physical exercise actually leads to a better lung capacity is debated. Studies focusing on this in a total population of youth with different levels of activities have been lacking, as well as studies comparing the effects on physical activity in smoking and non-smoking adolescents. Causality can not be confirmed, but, as discussed in Paper III, findings suggest a selection of youth with larger lung capacity into sports activities.

**Smoking prevention and cessation**

Information about short-term health effects (Paper I) is probably as important to adolescents as long-term effects, and could be beneficial in smoking prevention programs. To the extent that smoking is started by more stressed or depressed adolescents, more education and information alone will not prevent smoking. Preventive strategies should also offer medical and social support to these youths.

Frequency of physical activity was inversely related to current smoking consistent with other studies (Paper III). This, together with the finding that a much higher percent of smokers than never smokers quit sports, support the importance of promoting physical activity in smoking cessation and prevention. However, differences in smoking habits in different types of sports have previously received little attention, but must be taken into consideration. Different smoking habits also enhances the importance of smoking prevention within sports organizations.

Preventing the transition from occasional smoking to daily smoking would have a large personal and public health potential. Nicotine dependence of heavier smokers have been
reported previously in adolescence\textsuperscript{6,29,36}, but other possible differences between occasional and daily smokers have not been well documented. It is expected that many of the occasional smokers in the \textit{young-hunt} study will become daily smokers (Paper IV), but the observed differences between occasional and daily smokers may indicate that the adult pattern of intermittent smokers \textsuperscript{33,34} may start at an early age. Whether transitional or not, adolescent occasional smokers differs from daily smokers. Occasional smokers seem more likely to be in the contemplative stage needed to stop. A more academic approach in smoking cessation could be tried, and motivations other than health effects may be more important since their perceived health risk may be smaller than for daily smokers.

The early average age of smoking initiation strongly indicates that early intervention is necessary. Gender differences suggests that early intervention is especially important in girls.
7 Future research

The *young-hunt* study covers a series of topics that will give an important contribution to the understanding of somatic and mental health and lifestyle in adolescence. At present, six different additional projects are working with data from *young-hunt* including mental health and quality of life, eating disorders, headache, asthma and allergy, reading and writing disorders and life style. Validation of the questions used in the *young-hunt* study is needed, and this is being planned.

A longitudinal study gives possibilities to explore new and unanswered questions derived from the cross-sectional study. Presently, a four-year follow-up study of the *young-hunt* study, *young-hunt 2000/01*, is being conducted. Students (about 3500) who were in junior high schools (13-16 years) during the *young-hunt* study in 1995-97 are invited. These students are attending high schools (16-19 years) during the new study period from spring 2000 to spring 2001. The follow-up study has the same administration and the same procedures as in 1995-97, including questionnaire and clinical examinations (except for measuring blood pressure). This study is also a new cross-sectional study for the age group 16-19 years giving the possibility to study time trends. Youth not in school will get a closer monitoring. The adolescents who participated in the *young-hunt* study in 1995-97 will also be followed as adults in the planned HUNT III study. Adolescents, 13-19 years, will be included in HUNT III giving further possibilities to study time trends.

In addition to the longitudinal studies, data from the 1995-97 *young-hunt* study are in the process of being merged with data from the adult HUNT I and II to yield an unique opportunity to study genetic and social associations.

Findings from the *young-hunt* study, reported in this thesis, raises important questions. Gender differences have received little attention in adolescence and should be further studied:
- Why do adolescent smokers report more health problems than non-smokers? Are their health problems a result of smoking or are more youths with psychological stress or with poor health likely to start smoking? Are there gender differences?

- What role do respiratory symptoms and lung function play for the onset of smoking in adolescence? Are there gender differences in the development of respiratory symptoms and growth of lung function in adolescent non-smokers compared to smokers?

- What is the effect of physical activity on lung growth? Do differences apply to smokers and nonsmokers, and to gender?

- Is there a “window of opportunity”, beneficial to smoking cessation, in transition from non-smokers to regular smokers in adolescence? Can occasional smoking in adolescence be stable? How is the time trend in prevalence and incidence of smoking initiation at different ages? Are there gender differences in factors of importance to smoking initiation?
8 Conclusions

1. Associations between smoking and current health status in adolescence:

   - Compared to never smoking, daily smoking was associated with poorer perceived health and more respiratory symptoms, headache, neck and shoulder pain, stomachache, nausea, frequent heart beats, nervousness/restlessness and sleep problems in both boys and girls.

   - Girls were more vulnerable to the impact of cigarette smoking on both respiratory symptoms and lung function than boys.

   - In never smokers, there was a positive dose response association between physical exercise and better lung function (FVC and FEV1) in both boys and girls; no similar significant dose response relation was seen among daily smokers.

2. Effects of social factors and lifestyle that might be useful to smoking cessation and prevention in adolescents:

   - Frequency of physical activity was negatively associated with smoking in both boys and girls, but some types of sports were associated with more daily smokers, especially in girls. Both daily smokers and occasional smokers were more likely to have quit sports than never smokers.

   - Compared to daily smokers, occasional smokers were at higher academic levels in school, were more engaged in organized activities and sports, had been drunk less often and had better family role models with regard to smoking. Occasional smokers had quit smoking more often than daily smokers.
9 References


Paper I
Is not included due to copyright
Paper II
Gender differences in the impact of adolescent smoking on lung function and respiratory symptoms.

The Nord-Trøndelag Health Study, Norway, 1995-97

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Running head: Gender and impact of smoking in adolescence

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Gender difference in impact of smoking

Abstract

**Background:** Girls take up smoking at least as frequently as boys. If girls are more vulnerable to the impact of smoking, morbidity and mortality related to smoking could increase. The sex specific impact of adolescent smoking needs evaluation.

**Method:** All students in junior high and high schools in Nord-Trøndelag County, Norway, 1995-97, were invited to participate in a cross-sectional study. Information on smoking habits and respiratory symptoms was obtained by self-administered questionnaires. Spirometry was performed by specially trained nurses in accord with ATS standards.

**Results:** 8,305 students (83%) completed both questionnaire and spirometry. Among 6,811 students aged 13 to 18 years (50.3% girls) with no history of asthma, 2,993 (43.9%) reported never smoking, 665 (9.8%) reported occasional smoking and 667 (9.9%) reported daily smoking (mean initiation age: 13.9 years). Smoking was more common in girls (33.4% vs. 28.4%), but boys smoked more daily cigarettes and reported more pack years of smoking. In all smoking categories, including occasional smokers, smokers reported a higher prevalence of respiratory symptoms than nonsmokers; symptoms increased with smoke burden. Girls reported more symptoms compared to boys with comparable smoke burden. A dose-response relation between smoking and reduced levels of lung function was found in girls only.

**Conclusions:** Girls were more vulnerable than boys to the impact of smoking on both respiratory symptoms and lung function.

**Key words:** Adolescents, cigarette smoking, gender difference, lung function, respiratory symptoms, epidemiology
Cross-sectional studies of adults show lower levels of lung function in cigarette smokers compared to never smokers. Longitudinal studies indicate that smoking speeds age-related decline in lung function and has dose-related effects. Cross-sectional and longitudinal studies among children and adolescents also show that smoking adversely affects lung function. Respiratory symptoms are reported to be increased in smokers, and presence of wheeze in smokers may lead to a higher risk for low levels of lung function.

Studies of gender differences in adults show inconsistent results; several studies suggest that smoking has greater impact on lung function in men, whereas others report a more adverse effect in women. This difference may reflect gender differences in smoking habits in the populations or smoking may affect male and female lungs differently. Higher rates of wheeze and hyperresponsiveness in smoking women compared to men have been attributed, partly, to smaller airway caliber and smaller lung volume in women, with a disproportionately high dose of tobacco deposited in women than in men. Also, hormones may alter response in women. Tracheal epithelial response to cigarette smoke has been related to the estrous cycle.

The prevalence of adolescent smoking has been increasing. In many countries, girls smoke more frequently or at least as frequently as boys. In one of the few studies that focused on gender differences in respiratory symptoms and lung function in smoking adolescents, Gold and colleagues found cigarette smoking to be associated with mild airway obstruction and slowed growth of lung function in both sexes, but suggested that girls may be more vulnerable than boys to smoking’s effect on growth of lung function. If girls are more vulnerable to effects of smoking, this would have major health implications.

The aim of this study was to examine gender specific effects of smoking and smoke burden on respiratory symptoms and lung function in an adolescent population.
Gender difference in impact of smoking

MATERIAL AND METHODS

From August 1995 to June 1997, a large health survey, the Nord-Trøndelag Health Study (HUNT), was conducted in Nord-Trøndelag County, Norway. All students in junior high schools (aged 13-16 years) and high schools (aged 16-19 years) in the county were invited to the youth part of the study, YOUNG-HUNT. A self-administered questionnaire was completed during one school hour, in a setting with no opportunity to look at each other's papers. The questionnaire had no name or registration number, and was identifiable only by a bar code of the 11-digit personal number with which all Norwegians are registered at birth. Each student put the completed questionnaire in a blank envelope and sealed it. Project nurses collected the envelopes.

Questions and dichotomization used in this report are shown in the Appendix. Questions on respiratory symptoms were those used in the International Study of Asthma and Allergy in Childhood (ISAAC) 27. Current smokers were defined as those who answered "yes" to ever having tried smoking at least one cigarette and in addition answered "yes, I smoke daily" or "yes, I smoke occasionally, but not daily" to the question: "Do you smoke now?" (Appendix). Smokers were compared to those who answered "no" to ever having tried smoking. "Pack years" was defined as number of years of daily smoking multiplied by number of cigarettes smoked daily divided by twenty, and grouped as follows: "Never smokers": those who had never tried smoking; "Light smokers": pack years greater than zero, but less than one; "Medium smokers": one pack year or greater, but less than two; "Heavy smokers": two pack years or greater. Thirty self-reported daily smokers who did not report years of smoking were excluded. Smoke burden refers to occasional smoking and pack years. Passive smoking was defined as exposure to smoking at home by parents or siblings.
Gender difference in impact of smoking

A clinical examination that included spirometry and height and weight and was performed within a month after completion of the questionnaire. Spirometry was performed by specially trained nurses, in accord with American Thoracic Society (ATS) standards \textsuperscript{28}, using computerized pneumotachographs (Jaeger Masterscope, software version 4.15, Jaeger Inc, Wurtzberg, Germany). The acceptability of spirometry results was assessed both during the testing and during the data analysis, and included review of the computerized ATS error codes reported from the Masterscopes as well as visual inspection of volume/time and flow/volume graphics. Achieving end-of-test acceptability was confirmed either from the computerized ATS error code regarding flow plateaus or from visual inspection of spirometry displays during testing.

Forced vital capacity (FVC), forced expiratory volume in one second (FEV1), mid forced expiratory flow (FEF50) and FEV1 percent in relation to the maximal FVC (FEV1\%FVC) were registered. FVC was defined as the largest of either forced expiratory or forced inspiratory vital capacity from technically acceptable curves. The reported FEV1 was the largest value from technically acceptable curves. Standing height without shoes was measured using standardized meter measures.

Ethics

Each student signed a written consent to participate in the study. Parents of students who were less than 16 years of age also gave written consent. The Regional Medicine Ethical Research Committee and the Norwegian Data Inspectorate Board approved the study.
Statistics

Students who reported ever having had asthma were excluded from these analyses. Girls and boys were analyzed separately. Significance of gender differences was tested adding sex and smoking interaction to the models. Comparisons between age at onset of smoking and mean pack years were made using Independent Sample t-tests. For symptoms, comparisons were performed using logistic regression adjusted for age, exposure to passive smoking and smoking groups.

Lung function was analyzed using linear regression models with FVC, FEV1, FEF50 and FEV1%FVC as dependent variables. Because of hetrocedasity, logarithmic (ln) transformation of lung function (Y) was used to fit model assumptions. Separate models were made for daily smoking, occasional smoking, and different groups of pack years, adjusted for age, standing height, weight, passive smoking, physical activity, rhinitis and acute bronchitis with cough. Estimates and 95% confidence intervals are expressed as percent differences, calculated from the logarithmic scale, with those who had never tried smoking as reference.

SPSS Base 8.0 for Windows (SPSS Inc. Illinois, US) was used for all analyses.

RESULTS

Ninety-two percent of all students (aged 13-19 years) answered the questionnaire, and 8,305 (83%) also completed spirometry with acceptable expiratory flow volume curves. Included in these analyses were 6,811 students aged 13 to 18 years (50.3% girls) who reported never having had asthma (Table 1). Of this number 2,993 (43.9%) reported never having tried smoking, 665 (9.8%) reported occasional smoking, and 677 (9.9%) reported daily smoking (Table 2). Both daily and occasional smoking increased with age
Gender difference in impact of smoking

(p < 0.001). Mean age of smoking initiation was 13.9 years in both boys and girls for daily smokers, but was significantly later in occasional smokers, 14.3 years for boys (p=0.002) and 14.4 years for girls (p<0.001). Among daily smokers, mean years of daily smoking were 2.3 years in boys and 2.5 years in girls. On average, boys smoked more cigarettes daily (9.8 cigarettes) than girls (7.9 cigarettes) (p<0.001). There was no significant difference between overall mean pack years for boys (0.24) compared to girls (0.21) (p=0.21), but in the heavy smoking group (two pack years or more), boys had higher mean pack years (3.4) than girls (2.7) (p=0.001).

**Symptoms.** Compared to never smokers, more smokers reported recent (past 12 months) wheeze or dry cough at night in the absence of respiratory infection (Table 3). Symptoms increased with smoke burden. Among smokers with compatible smoke burden and among never smokers, girls reported more respiratory symptoms than boys (Fig 1). The finding of the greater increase in symptoms with increasing smoke burden in girls than in boys was confirmed by a significant sex-pack years interaction (p<0.001) in the logistic regression model.

**Lung function:** Occasional smokers had significantly better FVC than those who had never tried smoking (Fig. 2); this was true in both boys (p<0.001, mean difference 180 ml) and girls (p= 0.04, mean difference 62 ml). In similar comparisons only boys had significantly larger FEV1 (p= 0.002, mean difference 105 ml); no significant differences were found for FEF50 or FEV1%FVC in either boys or girls.

In daily smokers, a dose-response was found between smoking and levels of FEV1, FEF50 and FEV1%FVC in girls, but not in boys (Fig. 2). Compared to never smokers, FEV1 and FEF50 levels in girls were significantly lower only in heavy smokers (two packyears or more) (mean difference 145 ml, p=0.01 and mean difference 399 ml, p=0.002, respectively), whereas levels of FEV1%FVC were significantly lower for both
medium smokers (pack years one or more, but less than two) and heavy smokers (p=0.03 and p=0.001). The largest reduction, found in heavy smokers, was 3.8%. Both daily smoking boys and girls had higher FVC than never smokers, but boys had higher FVC with a higher smoke burden than girls. For girls this was significant only in light smokers (mean difference 120 ml, p=0.002), whereas in boys significantly higher levels of FVC were found in medium smokers (mean difference 213 ml, p=0.003) (Fig. 2). FVC decreased with increasing smoke burden in girls, but did not become significantly different from never smokers or from light smokers.

Although smoking adolescents were more likely than nonsmokers to have smoking family members, this source of passive smoking did not explain the gender differences (data not shown). Results were also not materially changed when analyses were repeated including the students with known asthma (data not shown). The effect of smoking on respiratory symptoms or lung function parameters did not differ in the 467 girls who used contraceptives compared to the girls who did not (data not shown).

DISCUSSION

In this large study of adolescents, with high participation rates and carefully supervised spirometry testing, girls were more vulnerable than boys to the effects of the same cigarette smoke burden on lung function and respiratory symptoms. To our knowledge, such gender differences in adolescent lung function (FEV1, FEF50 and FEV1/FVC) have not been published previously. A study by Gold et al.⁵ implied that girls might be more vulnerable than boys to the effect of smoking on growth of lung function, but reported no other gender difference.
Gender difference in impact of smoking

Increasing wheeze and cough with increasing smoke burden is in agreement with other studies \(^4,5,9\). Rates of wheeze and cough were higher for girls than for boys in each level of smoking, concordant with the findings of Gold et al. \(^5\). In the present study, girls who never smoked also reported more wheeze and cough than boys who had never smoked, but girls also reported more frequent symptoms with regard to multiple other health problems, suggesting that girls perceive symptoms differently than boys or report them more readily \(^20\).

Nevertheless, the greater increase in symptoms per level of smoke burden in girls compared to boys, suggest that girls really are more susceptible to changes in bronchial reactivity with smoking. In girls only, a dose – response relation was found between smoking and levels of FEF50 and FEV1\%FVC, parameters typically associated with obstructive airway disease \(^5,29\) in agreement with the greater increase in symptoms with increasing smoke burden in girls. The dose-response increase in symptoms seen in boys indicates that smoking has an early impact on respiratory function in boys too, and that symptoms precede changes in lung function, illustrating the potential importance of focusing on current health problems in young smokers when encouraging smoking cessation \(^30\).

The observation of increased symptoms in both sexes, whereas physiological consequences measured as changes in lung function are seen in girls only, is consistent with a gender difference secondary to the lower airway caliber in girls compared to boys.

Gold et al. \(^5\) also found reduced FEF25-75 and FEV1/FVC with the highest level of smoke burden in boys. This was not found in the present study, using the same measure of smoke burden (number of cigarettes per day, with 15 or more as highest level), and the same lung function parameters. The number of both boys and girls with the highest smoke burden (two pack years or more), was smaller in the present study than the number in the study of Gold et al. It is unlikely that a type II error in the present study explain the significant differences found in girls only, in that boys had the highest smoke burden.
Gender difference in impact of smoking

It has been postulated that effect of smoking on respiratory symptoms or lung function is modulated by hormonal factors. Only 13% of girls in the present study were using oral contraceptives, and no different effect of smoking on respiratory symptoms and lung function were observed in users compared to nonusers.

Lung capacity (FVC) was greater in light smokers compared to never-smokers, concordant with previous cross-sectional and longitudinal studies of young people. This suggest selection bias of adolescent smokers equivalent to "the healthy smokers effect", described in adult populations. This bias may explain the different impact of smoking on lung function seen in different cross sectional studies of young people. It is not known whether such selection bias applies differently to boys and girls, but it is unlikely that gender differences in pulmonary function in heavy smokers in explained by healthy smoker bias.

A correlation between smoking and the incidence of asthma and bronchial hyperreactivity has been reported, implying that girls, compared to boys, have an increased risk of bronchial hyperreactivity and of developing asthma if they smoke. To study the impact of smoking on respiratory symptoms and lung function we excluded students reporting known asthma, the majority of whom reported having asthma before they started smoking. Including students with known asthma in the analyses did not change the results.

All students with curves accepted after assessment of flow/volume curves were included in these analyzes, including students not meeting the 1987 ATS criteria judged by the ATS error code message from the Jaeger Masterscope. It is not recommended to exclude data because both expiration for 6 seconds and the reproducibility criteria have been shown to be difficult to meet in young people and people with small lung volumes. Excluding any group not achieving these recommendations might exclude smokers. Bronchial hyperreactivity in both boys and girls, and cigarette smoking in young girls especially, are important risk factors for not achieving ATS recommendations. Nevertheless, analyses that were also done
excluding students with different ATS error codes registered did not significantly change the results (data not shown).

Self-reported smoking habits and respiratory symptoms were potentially subject to biased reporting. However, anonymous study was designed to foster truthful reporting and self-reported smoking habits have been found to be reliable in young Norwegian men and women. Pack years was chosen as measure of smoke burden for daily smokers because both duration (years with smoking) and intensity (number of cigarettes) of smoke exposure are expected to affect lung function. Pack years could be biased by age when smoking began, but debut age did not affect lung function when substituted for pack years in regression model (data not shown).

These data support the thesis that girls are more susceptible to the effects of smoking than boys. Because girls now smoke more or at least as frequently as boys, the possibility that they are more vulnerable to the effects of smoking, suggests an increasing female burden of morbidity and mortality due to cigarette smoking. This plus the early average age of smoking initiation confirms the importance of early intervention for smoking prevention, especially for young girls.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the contributions of Bitte Dillan, Grete Bratberg Ross, Aina Enes, Inger Duvsete Holbø and the project nurses.
Reference List


Gender difference in impact of smoking


Gender difference in impact of smoking

**TABLE 1** Age and sex distribution of students, aged 13-18 years, who reported never having asthma, had acceptable flow-volume curves, and participated both in the questionnaire and the lung function test in the Young-Hunt study.

<table>
<thead>
<tr>
<th>Years</th>
<th>BOYS</th>
<th>GIRLS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
</tr>
<tr>
<td>13</td>
<td>553</td>
<td>(16.3)</td>
<td>552</td>
</tr>
<tr>
<td>14</td>
<td>646</td>
<td>(19.1)</td>
<td>663</td>
</tr>
<tr>
<td>15</td>
<td>639</td>
<td>(18.9)</td>
<td>671</td>
</tr>
<tr>
<td>16</td>
<td>569</td>
<td>(16.8)</td>
<td>569</td>
</tr>
<tr>
<td>17</td>
<td>544</td>
<td>(16.1)</td>
<td>507</td>
</tr>
<tr>
<td>18</td>
<td>432</td>
<td>(12.8)</td>
<td>465</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3383</td>
<td>(49.7)*</td>
<td>3427</td>
</tr>
</tbody>
</table>

* Percent of all.
Gender difference in impact of smoking

**TABLE 2** Smoking status in adolescents, 13-18 years, participating in the YOUNG-HUNT study with both self-reported questionnaire and spirometry with acceptable curves. Adolescents who ever had asthma were excluded.

<table>
<thead>
<tr>
<th>AGE 13-15 YEARS</th>
<th>AGE 16-18 YEARS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td><strong>Girls</strong></td>
</tr>
<tr>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Never tried smoking, not even once</td>
<td>979 (53.3)</td>
</tr>
<tr>
<td>Tried smoking, but not daily</td>
<td>438 (23.9)</td>
</tr>
<tr>
<td>Previous smokers</td>
<td>109 (5.9)</td>
</tr>
<tr>
<td>Occasional smokers</td>
<td>114 (6.2)</td>
</tr>
<tr>
<td>Daily smokers</td>
<td>113 (6.1)</td>
</tr>
<tr>
<td>Missing data</td>
<td>84 (4.6)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1838 (100.0)</td>
</tr>
</tbody>
</table>
Gender difference in impact of smoking

TABLE 3 Odds of wheeze or night cough in the last 12 months by smoke burden in adolescents included in the lung function study, adjusted for age and passive smoking and compared to those who had never tried smoking.

<table>
<thead>
<tr>
<th></th>
<th>Never tried smoking</th>
<th>Occasional smokers</th>
<th>Pack years &gt;0&lt;1</th>
<th>Daily smokers</th>
<th>Pack years ≥1&lt;2</th>
<th>Daily smokers</th>
<th>Pack years ≥2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)*</td>
<td>n (%)*</td>
<td>p</td>
<td>n (%)*</td>
<td>OR (CI)</td>
<td>p</td>
<td>n (%)*</td>
</tr>
<tr>
<td>BOYS:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheeze</td>
<td>182 (13.4)</td>
<td>48 (19.4)</td>
<td>1.5 (1.0-2.1)</td>
<td>0.03</td>
<td>44 (35.5)</td>
<td>3.3 (2.2-5.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cough</td>
<td>185 (12.4)</td>
<td>72 (25.9)</td>
<td>2.3 (1.6-3.1)</td>
<td>&lt;0.001</td>
<td>46 (35.4)</td>
<td>3.5 (2.3-5.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>GIRLS:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheeze</td>
<td>235 (18.5)</td>
<td>111 (35.2)</td>
<td>2.2 (1.7-2.9)</td>
<td>&lt;0.001</td>
<td>92 (56.4)</td>
<td>5.0 (3.5-7.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cough</td>
<td>250 (17.5)</td>
<td>119 (31.6)</td>
<td>2.0 (1.6-2.6)</td>
<td>&lt;0.001</td>
<td>101 (54.6)</td>
<td>5.2 (3.7-7.2)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* Percent of total number of boys and girls in the smoke burden group

Compared to wheeze, 25 more boys and 24 more girls answered the cough question.

Odds ratio (OR), Confidence interval (CI)
Gender difference in impact of smoking

**APPENDIX.** Questions and alternative answers used in the study.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Possible Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever tried smoking (at least one cigarette)?</td>
<td>Yes</td>
</tr>
<tr>
<td>If yes, do you smoke?</td>
<td>No</td>
</tr>
<tr>
<td>How old were you when you started smoking?</td>
<td>Yes, I smoke <em>cigarettes daily</em></td>
</tr>
<tr>
<td>How many years all together have you been smoking daily?</td>
<td>Yes, I smoke occasionally, but not daily</td>
</tr>
<tr>
<td>Does anyone in your home smoke?</td>
<td>No, previously I smoked daily</td>
</tr>
<tr>
<td>During the last 12 months, have you had problems with sneezing and/or a clogged or runny nose when you do NOT have a cold or the flu?</td>
<td>No, previously I smoked occasionally</td>
</tr>
<tr>
<td>During the last 12 months; have you had wheeze or heavy breathing?</td>
<td>No, I don't smoke</td>
</tr>
<tr>
<td>During the last 12 months; have you had dry cough at night without having a cold or the flu?</td>
<td>No, I don't smoke</td>
</tr>
<tr>
<td>Do you have a cold with cough or bronchitis today?</td>
<td>No, I don't smoke</td>
</tr>
<tr>
<td>Outside school hrs.: How many days a week do you play sports, or exercise to the point where you breathe heavily and/or sweat?</td>
<td>Every day</td>
</tr>
</tbody>
</table>

1 The answer is dichotomized into: no one smokes (no) and someone smokes (mother and/or father and/or siblings smoke)
Gender difference in impact of smoking

Figure 1  Wheeze last 12 months and cough at night (without having a respiratory infection) last 12 months in adolescents by smoke burden compared to those who had never tried smoking. Those who reported ever to have had asthma are excluded.
Figure 1

Wheeze last 12 months

%wheeze

Never sm
Occasional sm
Packyears=0<1
Packyears=1<2
Packyears=2

Boys
Girls

Smoking status

Cough at night last 12 months

%cough at night

Never sm
Occasional sm
Packyears=0<1
Packyears=1<2
Packyears=2

Smoking status
Gender difference in impact of smoking

Figure 2. Sex-specific effects of smoking on lung function in adolescents, 13-18 years; boys: $n=2124$ and girls $n=2211$. Percent differences and 95% confidence intervals for differences were calculated on a logarithmic scale using those who had never tried smoking as reference, and adjusting for age, height, weight, passive smoking at home, exercise, rhinitis and acute bronchitis with cough.
Gender difference in impact of smoking

Figure 2

BOYS

GIRLS

% difference in FVC

% difference in FEV1

% difference in FEF50

% difference in FEV1/FVC

Never

Occ

Packyr

Packyr

Packyr

sm

sm

>0<1

>=1<2

>=2

Never

Occ

Packyr

Packyr

Packyr

sm

sm

>0<1

>=1<2

>=2
Physical activity, sports, and lung function in smoking verses non-smoking adolescents.


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Running head: Sports, smoking and lung function in youth

Key words: Adolescents, smoking, physical activity, sports, lung function
Abstract

We studied the association between adolescent smoking habits and physical activity, particularly participation in different types of sports, and lung function.

All students aged 13-19 years in Nord-Trøndelag County, Norway, 1995-97, were invited to a cross-sectional study. Information on smoking habits and physical activity was obtained by self-administered questionnaire. Spirometry was performed in accord with ATS standards.

Of the 6,811 students (aged 13-18, without asthma,) included, 2,993 (44%) reported never smoking, and 1,342 (20%) reported current smoking (10% daily). Frequency of physical exercise was inversely associated with smoking, but participants in some types of sports were more likely to be daily smokers than non-participants. Both daily (53%) and occasional smokers (43%) were more likely to have quit sports than never smokers (26%). In never smokers, a positive dose response was found between physical exercise and better lung function (FVC and FEV1, adjusted for age and height); no similar significant association was observed in daily smokers.

These data suggest that smoking habits in different types of sports should be considered when promoting physical activity as smoking prevention, and sports organizations should include smoking prevention programs. Adolescents with better lung function may self-select into sports; this possibility needs to be studied in a longitudinal design.
Low physical activity is associated with increased morbidity and mortality in adulthood (1,2). An underlying premise for promotion of physical activity in youth is that it may persist through adulthood and may also reduce the risk for initiating unhealthy habits such as smoking (3).

Several cross-sectional studies have reported that physically active adolescents and those who participate in sports are less likely to be regular smokers (4-7) compared to sedentary youths. Encouraging participation in sports has been widely recommended for smoking cessation programs (4,8,9). Aaron et al (8) found female adolescents less likely to initiate smoking if they were more physically active or fit, but male adolescents showed a trend (not significant) toward more active individuals being more likely to initiate cigarette use. Smoking habits among participants of different types of sports have received little attention.

Some studies report a positive association between physical activity and physical fitness and lung capacity (10-13), while others do not (14). Whether physical activity increases lung function remains uncertain. Adult smoking sportmen exhibit some degree of lung function impairment compared to non-smoking sportmen, but still have better lung function than smokers who are not sportmen (15). Young swimmers have been found to have better lung function than sedentary youth, as have participants of other sport activities (10,16,17). An impact of training on lung growth in young swimmers has been suggested (16,17), but other studies have found no effect of physical activity on lung growth (18,19). Smoking in youth has been found to increase respiratory symptoms and decrease rate of lung growth (4,20-22).

In this paper we report the cross-sectional association between smoking habit and physical activity, participation in different types of sports, and lung function in adolescents.
MATERIAL AND METHODS

From August 1995 to June 1997 a large health survey, the Nord-Trøndelag Health Study (HUNT), was conducted in Nord-Trøndelag County, Norway. All students in Junior High Schools (13-16 years) and High Schools (16-19 years) in the county were invited to the youth part of the study, YOUNG-HUNT. A self-administered questionnaire was completed during one school hour, in a setting with no opportunity to look at each other’s papers. The questionnaire did not include the participants’ names, the subjects were linked to the questionnaire by a bar code of the 11-digit personal number with which all Norwegians are registered at birth. Each student put their completed questionnaire in a blank envelope and sealed it. Project nurses collected the envelopes.

Questions used in this presentation are shown in Appendix. Physical activity were assessed using frequency of exercise from the question: “Outside of school, how many days a week do you perform sports or exercise until you get short of breath and /or sweaty”. Activity was divided into three groups: “exercising 4 days a week or more”, “exercising 2 to 3 days a week” and “exercising 1 day a week or less”. Different kinds of sports were divided into the following five groups: “Individual high endurance sports” including cross country skiing, cycling and running; “Individual low endurance sports” including slalom skiing, horseback riding and gymnastics; “Swimming”; “Body building and fight sports” including body building, weightlifting, boxing, wrestling, Judo, Taekwondo and similar sports; and “Team sports” including football/soccer, handball, basketball and volleyball.

Current smokers were defined as those who answered “yes” to ever having tried smoking (at least one cigarette) and in addition answered “yes, I smoke daily” (daily
smokers) or “yes, I smoke occasionally, but not daily” (occasional smokers) to the question: “Do you smoke now?” Smokers were compared to those who answered “no” to ever having tried smoking one cigarette (never smokers). Passive smoking was defined as exposure to smoking at home by mothers, fathers or siblings.

Within a month after completing the questionnaire, the students underwent a clinical examination, performed in schools, including measuring of spirometry, and body size measures. Spirometry was performed by specially trained nurses, in accord with American Thoracic Society (ATS) standards (23), using computerized pneumotachograph (Jaeger Masterscope, software version 4.15, Jaeger Inc, Wurtzberg, Germany). The acceptability of spirometry results was assessed both during the testing and during the data analysis, and included review of the computerized ATS error codes reported from the Masterscopes, and visual inspection of volume/time and flow/volume graphics. Many subjects were unable to sustain expirations for 6 seconds or more before triggering automated cessation of collection of spirometry data. Achieving end-of-test acceptability was confirmed either from the computerized error code regarding flow plateaus or visual inspection of spirometry displays during testing.

Forced vital capacity (FVC), forced expiratory volume in one second (FEV1), mid forced expiratory flow (FEF50) and FEV1 percent in relation to the maximal FVC (FEV1%FVC) were registered. FVC was defined as whichever was largest of either forced expiratory or forced inspiratory vital capacity from technically acceptable curves.

The reported FEV1 was the largest value from technically acceptable curves. Standing height was registered without shoes with standardized meter measures.

Students reporting a history of asthma were excluded from these analyses.
Ethics

Each student signed a written consent to participate in the study. Parents of students less than 16 years also gave their written consent. The study was approved by the Regional Medicine Ethical Research Committee and the Norwegian Data Inspectorate Board.

Statistics

Comparisons of age at onset of smoking and leaving active sports were made by Independent Sample t-tests, and comparisons of categorical variables by chi square. Comparisons between daily smokers and those who had never tried smoking were performed using logistic regression with age, exposure to passive smoking and physical activity in the model. Amount of exercise (days per week with exercise) were adjusted for when comparing different types of sport activities. Separate models were used for girls and boys and for different types of sports.

Analyses of lung function were done by linear regression models with FVC, FEV1, FEV1%FVC and FEF50 as dependent variables. Because of heteroscedasticity, logarithmic (ln) transformation of lung function (Y) was used to fit model assumptions. Separate models were made for daily smokers and for those who had never tried smoking, adjusted for age, standing height, weight, passive smoking, physical activity, rhinitis and acute bronchitis with cough in both boys and girls. Estimates and confidence intervals are expressed as percent differences from the logarithmic scale, with those who reported lowest level of exercise (one day a week or less) as reference. Comparisons of height within each level of
physical exercise were also done at all ages (13-18) using one way analysis of variance. Girls and boys were analyzed separately. 95% confidence intervals (CI) are shown. SPSS Base 8.0 for Windows (SPSS Inc. Illinois, US) was used for all analyses.

RESULTS

Eighty-three percent (8,305) completed both questionnaire and spirometry. Included in these analyses were 6811 students without asthma, aged 13-18, 50% boys.

Smoking: As shown in Table 1, 2,993 students (45.0% of boys and 42.9% of girls) had never tried smoking and 1342 students (17.8% of boys and 21.6% of girls) reported current smoking, 9.9% daily (Table 1). Daily smoking increased with age (p < 0.001), and was marginally more common in girls (p=0.09). In daily smokers, mean age when smoking began was 13.9 years in both boys and girls. Overall, 52.2% boys and 52.8% girls reported being exposed to passive smoking at home.

Physical activity: Most students (68%) said they exercised at least 2 days a week outside school hours (Table 2). Boys exercised more than girls (p<0.001), and participated more in sports competition (p<0.001). Compared to the younger age group (13-15 years), both boys and girls in the older age group (16-18 years) exercised less (p<0.001) and joined in less sports competition (p<0.001). Compared to girls, more boys participated or had participated in individual endurance sport (p<0.001) and bodybuilding and fight sports (p<0.001), while girls participated more in individual low endurance sport (p<0.001) (Table 2). Overall, 31.4% boys and 34.4% girls reported having participated in sports previously but not currently.

Physical activity, sports and smoking: Current smoking was more prevalent in students with lower levels of physical exercise (Fig. 1). It was more common in body building and fighting sports, swimming, and individual low endurance sports compared
to team sport and individual high endurance sport, especially in girls (Table 3). More daily smokers (51.6 of boys, 60.7 of girls) and occasional smokers (42.7% of boys, 38.9% of girls) had dropped out of active sports compared to never smokers (25.7% boys, 26.8% girls), p<0.001. Mean age for quitting sports was similar in daily smokers (boys 14.8, girls 14.5) and never smokers (boys 14.5, girls 13.9). About 35% had started smoking before they quit sports; another 30% started smoking and quit sports in the same year.

Daily smokers reported less physical activity and less participation in sport competitions than never smokers (Table 4). Both boys and girls currently participating in team sport and sport competitions (regardless of what type of sport) were less likely to be daily smokers than those who did not. In boys, daily smoking was positively associated with both current and previous participation in bodybuilding and fight sports and with present participation in swimming. Girls who had previously participated in these types of sports and low endurance sports were more often daily smokers than girls who had not participated. Few daily smoking girls were participating in bodybuilding/ fight sports and swimming, however (Table 3).

Lung function and physical activity. A significant difference in mean height by exercise status was seen only between the highest and lowest level of exercise at age 13 (mean difference 2.2 cm, p=0.01). To be certain that different height at different levels of exercise did not explain different lung capacity, age and height were adjusted for in the regression analyses of lung function.

In never smoking boys and girls there was a step-wise increase in levels of FVC and FEV1 with increasing frequency of exercise (Fig 2). There was a clinically and statistically significant mean difference between the highest and lowest level of exercise for FVC was: boys 195 ml, p<0.001, girls 122 ml, p<0.001 and for FEV1: boys 154 ml,
p<0.001, girls 119 ml, p<0.001. The same dose response relationship was observed in
daily smokers, but this trend was not statistically significant (fig. 2). Daily smoking boys
with medium level of exercise had significantly larger FEV1 compared to the lowest
level of exercise. No significant associations were found between FEF50 and
FEV1%FVC and frequency of exercise in never smokers or daily smokers.

Both never smoking boys and girls who participated in sports competitions
(regardless of type of sport) had larger FVC, FEV1 and FEF50 compared to those who
did not participate (adjusted for frequency of exercise). Mean differences in boys: FVC
95 ml, p=0.01, FEV1 113ml, p<0.001, FEF50 155ml, p=0.03, and in girls: FVC 65ml,
p=0.04, FEV1 70ml, p=0.01, FEF50 156ml, p=0.02. No such differences were found in
daily smokers.

Lung function and different types of sports. Never smoking boys and girls who
presently participated in team sport had marginally higher FEF50 (mean difference:
boys 174ml, p=0.05, girls 151ml, p=0.06) than those who did not. Girls participating in
team sports also had larger FEV1 (mean difference 80ml, p=0.03) compared to non-
participating girls. Daily smoking boys who presently participated in low endurance
sport had significantly lower FEV1 (p=0.05) and FEF50 (p=0.04) than non-participating
boys. No other differences were found for other types of sports in never smokers or
daily smokers.

Never smoking boys and girls who remained active in sports had better lung
capacity compared to those who were no longer active. Mean difference in boys: FVC:
135ml, p<0.001, FEV1: 125ml, p<0.001, and in girls FVC: 69ml, p=0.01, FEV1: 63ml,
p=0.01. No such difference was seen in daily smokers.
DISCUSSION

In this study of a large general population of adolescents, with high participation rate and carefully supervised spirometry testing, higher levels of physical exercise were associated with less daily smoking overall, but daily smoking was more frequent in students who participated or had previously participated in some types of sports, most notably, individual low endurance sports, body building, fighting sports and swimming. Larger lung capacity (FVC and FEV1) independent of age and height was found in never smokers with higher levels of physical exercise, no similar significant association was observed in daily smokers.

The inverse association between physical activity and current smoking is consistent with other studies (4,5,7,8). This observation, along with the finding that a much larger percent of smokers than never smokers had quit sports, suggests a role for promoting physical activity in smoking prevention. However, some types of sports were associated with more smoking, even after adjusting for the frequency of exercise. Daily smoking was more often associated with individual sports either demanding less endurance, or associated with less frequent participation in competitions. It is not clear whether these differences by type of sport are because smoking is perceived as less likely to impair performance or reflect peer influence, which plays an important part in adolescent smoking (4,24,25).

Difference in smoking habits among different types of sport has previously received little attention. If confirmed elsewhere, it suggests that type of sport should be considered when sports are recommended for smoking prevention or cessation. The importance of focusing on smoking prevention within sport organizations (26) is further supported by the observation that the age of smoking initiation either preceded or coincided with the age of quitting sports.
Whether physical exercise actually leads to better lung capacity cannot be determined in a cross-sectional study. In a prospective study, very young female competitive swimmers were found to increase their vital capacity and total lung capacity during a year of training (17), suggesting that the larger lung volumes in swimmers may be due to impact of training on lung growth. No impact of training on lung growth has been found in older swimmers or other youth (18,19). Being good in sports may depend on a better lung capacity, representing a self-selection of adolescents who both join and continue with sports. Self-selection is a plausible explanation why never smoking students who had discontinued sports had a lower lung capacity compared to never smokers who were still active.

In this (21) and other studies (20,22,27), daily smokers with a light smoke burden were found to have a larger lung capacity (FVC) than non-smokers. If daily smokers already with good lung function self select into physical activity, this would tend to diminish the observed “effects” of exercise. This possibility is supported by the finding that, among less active students, daily smokers had larger FVCs than never smokers, while no significant difference in lung capacity was found between daily and never smokers who were more physically active. Few daily smokers exercised at high levels, however, and it cannot be excluded that the absent significant association reflects only the small number of daily smoking athletes.

In this student population, the frequency of physical exercise, not the type of sport, was associated with better lung capacity; this has been reported in some studies of athletes, particularly in swimmers (10,12,16,17). In the present study, swimmers did not have better lung capacity than non-swimmers, but there were few swimmers and none competed at a high level. The independent association between participation in
sports competition and larger lung function also suggests that intensity of physical activity may be associated with larger lung function.

In spite of the computerised ATS error code warnings during testing, and careful assessment of the quality of the flow/volume curves by the nurses, a number of students did not meet the 1987 ATS criteria as judged by the ATS error code messages from the Jaeger Masterscope. As meeting the ATS criteria in adolescents have been reported to be difficult (23,28-30), and excluding any group not achieving ATS recommendation might exclude smokers, all students are included in the analysis. However, there were no significant differences in associations when all analysis of lung function values and physical exercise were performed with or without students who did not meet the different Jaeger Masterscope ATS error codes. To study the association between physical activity and lung function in daily smokers and never smokers, we excluded students who reported a history of asthma. Larger values of FEF50 and FEV1 in never smoking participants in team sport may reflect less airway dysfunction (not diagnosed as asthma) in students participating in these sports.

In this study, smoking habits were self-reported, and potentially subject to biased reporting. Some features of the study design, including confidentiality and smoking not being the study focus, were intended to foster truthful reporting. The consistency with other studies of adolescent smoking in terms of prevalence, age at initiation, and gender differences support the validity and generalizability of these results (4,31,32). The long dark winters of northern Norway may impact exercise preferences in youth, but do not appear to have impacted smoking patterns.

CONCLUSION

Higher frequencies of physical exercise were associated with less daily smoking, but daily smoking was more common in youth performing body building sport, fighting sports
and swimming than in other sports. Smokers quit sports participation more often than never smokers. Adjusted for age and height, a significant dose-response relation between larger lung capacity (FVC and FEV1) and levels of physical exercise was found in never smokers, but not in daily smokers. These data provide indirect support for promotion of physical activity as smoking prevention, and suggest that sport organizations should include smoking prevention programs. Initiation of sport programs before the average age of smoking initiation (age 13 in this study) could potentially yield long-term benefits in pulmonary function. A selection of adolescents with better lung function into sports is also suggested by these data, but causality will need to be studied prospectively.

ACKNOWLEDGEMENTS

This study was supported by the Norwegian Research Council, the Norwegian State Department of Social and Health Affairs, the County of Nord-Trøndelag, Norway and ASTRA ZENECA AS. The authors gratefully acknowledge the contributions of Bitte Dillan, Grete Bratberg Ross, Aina Enes, Inger Duvsete Holbø and the project nurses.
Reference List


TABLE 1  Smoking status in adolescents, 13-18 years, participating in the YOUNG-HUNT study with both self-reported questionnaire and spirometry. Adolescents who reported ever having asthma were excluded.

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>Boys n (%)</th>
<th>Girls n (%)</th>
<th>TOTAL n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never tried smoking, not even one cigarette</td>
<td>1522 (45.0)</td>
<td>1471 (42.9)</td>
<td>2993 (43.9)</td>
</tr>
<tr>
<td>Tried smoking, but reported to be non smokers</td>
<td>929 (27.5)</td>
<td>898 (26.2)</td>
<td>1827 (26.8)</td>
</tr>
<tr>
<td>Previous smokers</td>
<td>199 (5.9)</td>
<td>238 (6.9)</td>
<td>437 (6.4)</td>
</tr>
<tr>
<td>Occasional smokers</td>
<td>282 (8.3)</td>
<td>383 (11.2)</td>
<td>665 (9.8)</td>
</tr>
<tr>
<td>Daily smokers</td>
<td>320 (9.5)</td>
<td>357 (10.4)</td>
<td>677 (9.9)</td>
</tr>
<tr>
<td>Missing data*</td>
<td>132 (3.9)</td>
<td>80 (2.3)</td>
<td>212 (3.1)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3384 (100.0)</td>
<td>3427 (100.0)</td>
<td>6811 (100.0)</td>
</tr>
</tbody>
</table>

* Students who did not answer the questions on smoking.
TABLE 2  Physical activity and present and previously participation in different sports in adolescents, 13-18 years, attending both questionnaire and spirometry in the YOUNG-HUNT study. Adolescents who reported ever having asthma were excluded. n= 6811

<table>
<thead>
<tr>
<th>Activity</th>
<th>AGE 13-15 YEARS</th>
<th>AGE 16-18 YEARS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys n (%)</td>
<td>Girls n (%)</td>
<td>Boys n (%)</td>
</tr>
<tr>
<td>Exercise until sweaty &gt;=4 days a week (outside school)</td>
<td>610 (33.2)</td>
<td>424 (22.5)</td>
<td>501 (32.4)</td>
</tr>
<tr>
<td>Exercise until sweaty 2-3 days a week (outside school)</td>
<td>765 (41.6)</td>
<td>895 (47.5)</td>
<td>509 (32.9)</td>
</tr>
<tr>
<td>Exercise until sweaty &lt;=1 day a week (outside school)</td>
<td>444 (24.2)</td>
<td>552 (29.3)</td>
<td>530 (34.3)</td>
</tr>
<tr>
<td>Join in sports competitions</td>
<td>979 (53.3)</td>
<td>934 (49.5)</td>
<td>634 (41.0)</td>
</tr>
<tr>
<td>Participate or previously participated in sports:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual high endurance sports</td>
<td>583 (31.7)</td>
<td>451 (23.9)</td>
<td>496 (32.1)</td>
</tr>
<tr>
<td>(cross-country skiing, cycling, running)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual low endurance sports</td>
<td>340 (18.5)</td>
<td>717 (38.0)</td>
<td>209 (13.5)</td>
</tr>
<tr>
<td>(slalom, ski jumping, horseback riding, gymnastics)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bodybuilding and fight sports</td>
<td>243 (13.2)</td>
<td>75 (4.0)</td>
<td>271 (17.5)</td>
</tr>
<tr>
<td>(bodybuilding, weight lifting, wrestling, judo, karate and similar fight sports)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>178 (9.7)</td>
<td>188 (10.0)</td>
<td>136 (8.8)</td>
</tr>
<tr>
<td>Team sports</td>
<td>1327 (72.2)</td>
<td>1354 (71.8)</td>
<td>1113 (72.0)</td>
</tr>
<tr>
<td>(football/soccer, handball, basket ball, volleyball)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

25 boys and 19 girls did not answer the question of days with exercise pr week.
TABLE 3  Present participation in different sports in never-, occasional- and daily- smoking adolescents, 13-18 years, attending both questionnaire and spirometry in the YOUNG-HUNT study. Adolescents who reported ever having asthma were excluded. n= 6811 students

<table>
<thead>
<tr>
<th>Type of sport</th>
<th>BOYS</th>
<th></th>
<th></th>
<th>GIRLS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never smokers</td>
<td>Occasional smokers</td>
<td>Daily smokers</td>
<td>Total</td>
<td>Never smokers</td>
<td>Occasional smokers</td>
<td>Daily smokers</td>
</tr>
<tr>
<td>Individual high endurance sports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(cross-country skiing, cycling, running)</td>
<td>392 (84.1)</td>
<td>44 (9.4)</td>
<td>30 (6.4)</td>
<td>466 (100)</td>
<td>252 (78.8)</td>
<td>50 (15.6)</td>
<td>18 (5.6)</td>
</tr>
<tr>
<td>Individual low endurance sports</td>
<td>173 (80.8)</td>
<td>21 (9.8)</td>
<td>20 (9.3)</td>
<td>214 (100)</td>
<td>332 (70.6)</td>
<td>98 (20.9)</td>
<td>40 (8.5)</td>
</tr>
<tr>
<td>(slalom, ski jumping, horseback riding, gymnastics)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bodybuilding and fight sports</td>
<td>117 (62.9)</td>
<td>37 (19.9)</td>
<td>32 (17.2)</td>
<td>186 (100)</td>
<td>39 (60.9)</td>
<td>17 (26.6)</td>
<td>8 (12.5)</td>
</tr>
<tr>
<td>(bodybuilding, weight lifting, wrestling,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>judo, karate and similar fight sports)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>86 (73.5)</td>
<td>15 (12.8)</td>
<td>16 (13.7)</td>
<td>117 (100)</td>
<td>74 (71.2)</td>
<td>22 (21.2)</td>
<td>8 (7.7)</td>
</tr>
<tr>
<td>Team sports</td>
<td>758 (80.6)</td>
<td>114 (12.1)</td>
<td>68 (7.2)</td>
<td>940 (100)</td>
<td>704 (77.7)</td>
<td>146 (16.1)</td>
<td>56 (6.2)</td>
</tr>
</tbody>
</table>
TABLE 4  Frequency of exercise and participation in different types of sports in never smoking compared to daily smoking adolescents attending both questionnaire and spirometry in the YOUNG-HUNT study.
Regression models are adjusted for age, passive smoking at home and frequency of exercise (competition and sports).
Exercise 2-3 days and 4 days or more a week are compared to exercise one day a week or less.
Odds Ratio (OR), 95% Confidence Intervals (CI), statistical significans (p).
Adolescents who reported ever having asthma were excluded. n= 6811 students.

<table>
<thead>
<tr>
<th>Exercise and sports:</th>
<th>BOYS</th>
<th></th>
<th>GIRLS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise until breathless/sweaty 2-3 days a week</td>
<td>0.4 (0.3-0.5)</td>
<td>&lt;0.001</td>
<td>0.4 (0.3-0.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Exercise until breathless/sweaty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 days a week or more</td>
<td>0.2 (0.1-0.3)</td>
<td>&lt;0.001</td>
<td>0.3 (0.3-0.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Join in sports competitions</td>
<td>0.4 (0.3-0.8)</td>
<td>0.003</td>
<td>0.4 (0.2-0.7)</td>
<td>0.001</td>
</tr>
<tr>
<td>Presently participating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formerly participating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual high endurance sports</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(cross-country skiing, cycling, running)</td>
<td>0.7 (0.4-1.1)</td>
<td>0.159</td>
<td>1.3 (0.8-2.0)</td>
<td>0.318</td>
</tr>
<tr>
<td>Individual low endurance sports</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(slalom, ski jumping, horseback riding, gymnastics)</td>
<td>1.3 (0.7-2.2)</td>
<td>0.404</td>
<td>1.4 (0.8-2.6)</td>
<td>0.199</td>
</tr>
<tr>
<td>Bodybuilding and fight sports</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(bodybuilding, weight lifting, wrestling, judo, karate and similar fight sports)</td>
<td>3.0 (1.8-4.9)</td>
<td>&lt;0.001</td>
<td>3.2 (1.9-5.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Swimming</td>
<td>1.9 (0.9-3.6)</td>
<td>0.038</td>
<td>0.7 (0.4-1.8)</td>
<td>0.694</td>
</tr>
<tr>
<td>Team sports</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(football/soccer, handball, basket ball, volley ball)</td>
<td>0.5 (0.3-0.8)</td>
<td>0.003</td>
<td>1.7 (0.9-3.2)</td>
<td>0.132</td>
</tr>
<tr>
<td>Presently participating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formerly participating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX. Questions and alternative answers used in this presentation from the YOUNG-HUNT study.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Possible Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever tried smoking (at least one cigarette)?</td>
<td>Yes, I smoke, cigarettes daily</td>
</tr>
<tr>
<td>If yes, do you smoke?</td>
<td>Yes, I smoke occasionally, but not daily</td>
</tr>
<tr>
<td>How old were you when you started smoking?</td>
<td>No, previously I smoked occasionally</td>
</tr>
<tr>
<td>How many years all together have you been smoking daily?</td>
<td>No, previously I smoked occasionally</td>
</tr>
<tr>
<td>Does anyone in your home smoke?</td>
<td>No, I don't smoke</td>
</tr>
<tr>
<td>Not during the average school day:</td>
<td></td>
</tr>
<tr>
<td>How many days a week do you play sports or exercise to the point where you breath heavily and/or sweat?</td>
<td>No, mother, Yes, father, Yes, siblings</td>
</tr>
<tr>
<td>Are you actively involved in sports?</td>
<td>Every day 4-6 days a week</td>
</tr>
<tr>
<td>How old were you when you stopped participating?</td>
<td>2-3 days a week</td>
</tr>
<tr>
<td>Which sport(s) do/did you participate in?</td>
<td>1 day a week</td>
</tr>
<tr>
<td>Do you participate in competitive sports?</td>
<td></td>
</tr>
<tr>
<td>Skiing (cross country)</td>
<td>Skiing (slalom/ki jump)</td>
</tr>
<tr>
<td>Soccer/football</td>
<td>Horse riding</td>
</tr>
<tr>
<td>Handball/basket/volleyball</td>
<td></td>
</tr>
<tr>
<td>Fight sports/boxing</td>
<td>Body building</td>
</tr>
<tr>
<td>Weight lifting</td>
<td>Cycling</td>
</tr>
<tr>
<td>Swimming</td>
<td>Track/field/orientation</td>
</tr>
<tr>
<td>Yes, but I used to participate</td>
<td>No</td>
</tr>
<tr>
<td>No, but I used to participate</td>
<td>No</td>
</tr>
</tbody>
</table>
Sports, smoking and lung function in youth

Figure 1  Frequency of exercise until sweaty or breathless outside school and smoking habits in adolescents, 13-18 years, attending both questionnaire and spirometry in the YOUNG-HUNT study. Students who reported ever having asthma were excluded. N=6811 students.  *Never sm*: never smokers; *Occ sm*: occasional smokers; *Daily sm*: daily smokers.
Effects of physical exercise on lung function in never smoking and daily smoking adolescents, 13-18 years, attending both questionnaire and spirometry in the YOUNG-HUNT study. Students who reported ever having asthma were excluded. Percent differences and 95% confidence intervals for differences were calculated on a logarithmic scale using those who had the lowest level of exercise (one day a week or less) as reference, and adjusting for age, height, weight, passive smoking at home, rhinitis and acute bronchitis with cough.
Paper IV

Turid Lingaaas Holmen, M.D.,* 1 2 Elizabeth Barrett-Connor, M.D.,† Jostein Holmen, M.D., Ph.D.,* 1 2 and Leif Bjørner, M.D., Ph.D.¥

*National Institute of Public Health, Community Medicine Research Unit, Verdal, Norway; †Department of Family and Preventive Medicine, University of California, San Diego; ¥Department of Community Medicine and General Practice, Norwegian University of Science and Technology, Trondheim, Norway; and ¥Department of Lung Medicine, Norwegian University of Science and Technology, Trondheim, Norway

Background. Adolescent smokers are often unsuccessful in quitting and difficult to retain in cessation programs. In health promotion, focusing on the right target groups is essential.

Aim. The aim was to examine if adolescent occasional smokers differ from daily smokers, and if possible differences could be useful for targeted smoking cessation programs.

Methods. Ninety-one percent of all teenagers attending junior high or high schools participated in a cross-sectional study, conducted in Nord-Trøndelag County, Norway, 1995–1997, including 8,460 students 13–18 years old. Information on smoking habits, education, after school activities, and parents was obtained by self-administered questionnaires.

Results. Fifty-four percent of boys and 57% of girls had tried at least one cigarette. Of these, 36% of boys and 41% of girls were current smokers, half of whom reported occasional smoking. Students who had quit smoking had more often been occasional than daily smokers. Compared to daily smokers, occasional smokers participated in higher academic courses, were more engaged in organized activities and sports, had been drunk less often, and had better family role models.

Conclusion. Differences support potential utility of focusing on occasional smokers as a target group in smoking cessation programs.

Key Words: smoking; adolescence; target groups; social differences; occasional smoking; smoking cessation.

INTRODUCTION

Despite prevention efforts, the prevalence of smoking in adolescence has been increasing [1–3]; programs to help adolescents quit smoking are needed. Young people appear to progress through a sequence of stages from receptivity to dependence on tobacco [4]. Both environmental and individual factors influence this progress. Susceptibility to smoking, family role models, peer influence, self-esteem, advertising, depression, and anxiety are all said to play an important role in initiation of childhood and adolescent smoking [5–12]. Atitude toward cigarettes and smoking role models, in combination with poor adjustment in school and access to cigarettes, appear to make early initiators more likely to continue smoking [1, 13, 14]. Smokers have been shown to be less physically active and to have more health problems than nonsmokers [1, 15, 16]. Previous research has suggested that early initiation predicts longer duration, heavier daily consumption, and greater chances of nicotine dependence [5, 17, 18]. Smoking will be a long-term addiction for many adolescents who start smoking [1, 19].

Once teenagers graduate to a given smoking status, return to earlier stages is uncommon [20]. Studies have shown that adolescent smokers frequently try to quit, but are usually unsuccessful, often have withdrawal reactions, are difficult to recruit and retain in cessation programs, and are not responsive to these programs [1]. Daily smoking in adolescence seems to be resistant to change despite an expressed desire and repeated
cutback attempts [21]; occasional smokers have been shown to quit smoking more often [22]. Thus, occasional smokers could be an important target group for smoking cessation who could be discouraged from moving into daily smoking status. Success in smoking prevention or cessation programs requires identification of appropriate target groups.

Nicotine dependence of heavier smokers is recognized [1,21,23,24], but other possible differences between current occasional smokers and heavy smokers are not well documented. The aim of this study was to examine possible individual and environmental differences between adolescent occasional smokers and daily smokers, and identify possible differences that could be useful for smoking cessation programs.

METHODS

In the 2-year period from August 1995 to June 1997 a large health survey, the Nord-Trendelag Health Survey (HUNT), was conducted in Nord-Trendelag County, Norway. The county has 127,000 inhabitants and consists of rural and industrial areas with small social differences. Except for lacking a large city, it is a fairly representative cohort of the Norwegian population.

All students in junior schools (13–16 years) and high schools (16–19 years) in the county were invited to the youth part of the study, YOUNG-HUNT. Ninety-one percent completed a self-administered questionnaire during one school hour, using the same settings as an examination, with no opportunity to look at each other’s papers. No name or registration number was written on the questionnaire, which was identifiable only by a bar code of the 11-digit personal number with which all Norwegians are registered at birth. Each student put their completed questionnaire in an envelope without identification and sealed it. Project nurses collected the envelopes.

Relevant questions are shown in the appendix. Questions with more than two answering alternatives were dichotomized as shown in the appendix. Daily and occasional smokers listed age of smoking debut. Occasional smokers (current, but not daily smokers) are defined as those who answered “yes” to the question “Have you ever tried smoking?” and “Yes, I smoke occasionally, but not daily” to the question “Do you smoke now?” (Appendix). Daily smokers are defined as those who answered “yes” to the question “Have you ever tried smoking?” and on the question “Do you smoke now?” marked the alternative “Yes, I smoke (number) cigarettes daily” and provided the number of cigarettes (Appendix). Those who listed the number of cigarettes smoked daily without marking the question were also included. Current smokers are defined as those who answered “yes” to either daily or occasional smoking. In this study, current occasional smokers were compared to current daily smokers.

Ethics

Each student signed a written consent to participate in the study and the parents of the students under 16 also gave their written consent. The study was approved by the Regional Medicine Ethical Committee and the Norwegian Data Inspectorate Board.

Statistics

Pearson chi-square and odds ratios (OR) analyses were used to compare occasional smokers with daily smokers. Because of multiple comparisons, significance was set at $P < 0.01$; 95% confidence intervals (CI) are shown. Logistic regression, with occasional versus daily smokers as the dependent variable, was performed to estimate the independent importance of each factor. Separate models were made for environmental factors, including parents divorced, mother/father/sibling’s smoking, and seen parents drunk, and for individual factors, including education, perceived health, out with friends, homework, watching TV, organized activities,

**TABLE 1**

<table>
<thead>
<tr>
<th>Smoking Status in Boys and Girls Attending the YOUNG–HUNT Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 13–15 years</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Male n (%)</td>
</tr>
<tr>
<td>Never tried smoking, not even one cigarette</td>
</tr>
<tr>
<td>Male n (%)</td>
</tr>
<tr>
<td>Tried smoking, but were never smokers</td>
</tr>
<tr>
<td>Previous smokers</td>
</tr>
<tr>
<td>Occasional smokers</td>
</tr>
<tr>
<td>Daily smokers</td>
</tr>
<tr>
<td>Missing data +</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

**Notes:**

- 135 boys and 94 girls did not answer the question “Did you ever try smoking?” and 61 boys and 26 girls who had tried smoking did not answer the question “Do you smoke now?”

**Total n (%)**

| Age 13–15 years | 3639 (43.0) |
| Age 16–18 years | 2308 (26.2) | 2219 (26.2) | 2219 (26.2) | 808 (9.6) | 931 (10.8) | 316 (3.7) | 8460 (100.0) |
organized sport, frequency of exercise, and drunkenness. Sex-specific analyses were stratified by age (13–15 and 16–18 years). Comparisons between debut ages were made using independent sample t tests. SPSS was used for all analyses.

RESULTS

Ninety-one percent of all students, 13–19 years, in the county (4,741 students in junior high school and 4,209 students in high school) participated in the study. All participants who were aged 13–18 years (8,460) were included in these analyses (Table 1).

More than half of all students (54.3% boys and 57.3% girls) had tried at least one cigarette. Current smoking was reported by 37.5% of these (n = 1,722), 34.7% of boys and 40.2% of girls. About half of current smokers reported that they were occasional smokers (Table 1). Both occasional and daily smoking were generally more common among girls than boys and increased with age in both sexes. However, fewer 18-year-olds than 17-year-olds reported daily smoking. Up to the age between 15 and 16, occasional and daily smoking were equally common in boys while occasional smoking was more common in girls (Fig. 1). After age 16, daily smoking was more common than occasional smoking in both boys and girls. Mean age of smoking onset was similar in boys and girls and slightly lower for daily smokers (13.9 years) than occasional smokers (14.4 years) (P < 0.001).

Of those who had tried smoking, 12.1% (564 students) reported that they had smoked previously, but had quit smoking. Most quitters, 72%, said they had been previous occasional smokers. Among previous daily smokers less than age 16, significantly more boys (63.0%) than girls (37.0%) had quit smoking (P = 0.001); no such difference was found in the older age group.

The following analyses compare occasional smokers with daily smokers, among those who were current smokers at the time they completed the questionnaire.
### Table 2A
Odds of Being Occasional vs Daily Smoker by Environmental Factors for Adolescents Aged 13–15 Years*

<table>
<thead>
<tr>
<th></th>
<th>Occasional n (%)</th>
<th>Daily n (%)</th>
<th>OR (CI)</th>
<th>P</th>
<th></th>
<th>Occasional n (%)</th>
<th>Daily n (%)</th>
<th>OR (CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents not divorced</td>
<td>94 (71.8)</td>
<td>103 (69.6)</td>
<td>1.1 (0.7–1.9)</td>
<td>0.692</td>
<td>165 (78.6)</td>
<td>83 (63.8)</td>
<td>2.1 (1.3–3.4)</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Never saw parents drunk</td>
<td>32 (25.2)</td>
<td>27 (19.3)</td>
<td>1.4 (0.8–2.5)</td>
<td>0.245</td>
<td>58 (28.9)</td>
<td>32 (25.6)</td>
<td>1.2 (0.7–2.0)</td>
<td>0.523</td>
<td></td>
</tr>
<tr>
<td>Mother does not smoke</td>
<td>81 (61.8)</td>
<td>70 (47.3)</td>
<td>1.8 (1.1–2.9)</td>
<td>0.015</td>
<td>116 (55.2)</td>
<td>43 (33.1)</td>
<td>2.5 (1.6–3.9)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Father does not smoke</td>
<td>52 (39.7)</td>
<td>58 (39.2)</td>
<td>1.0 (0.6–1.7)</td>
<td>0.931</td>
<td>71 (33.8)</td>
<td>56 (43.1)</td>
<td>0.7 (0.4–1.1)</td>
<td>0.086</td>
<td></td>
</tr>
<tr>
<td>Siblings do not smoke</td>
<td>105 (80.2)</td>
<td>112 (75.7)</td>
<td>1.3 (0.7–2.3)</td>
<td>0.369</td>
<td>180 (85.7)</td>
<td>97 (74.6)</td>
<td>2.0 (1.2–3.6)</td>
<td>0.010</td>
<td></td>
</tr>
</tbody>
</table>

*Odds ratio (OR), 95% confidence interval (CI).

Note. Because missing data were excluded, the number of subjects varied for each factor.

### Environmental Factors (Tables 2A and 2B)
In the age group 13–15 years, occasional smoking girls were less likely to have divorced parents, and smoking mothers or siblings than daily smoking girls. These differences were not seen in boys. The father's smoking status was unrelated to smoking habit in boys or girls. In the older ages (16–18 years), however, significant differences between occasional and daily smokers of both sexes were found for all factors studied with one exception: fathers' smoking was more common in occasional smoking boys; no difference was found in girls.

Sixty-five percent of all students reported that they had seen their parents drunk. Compared to daily smokers, not seeing their parents drunk was more common only in the oldest occasional smoking girls.

In the regression model including environmental factors, comparing occasional and daily smokers, mothers of occasional smokers being less likely to smoke was the most influential factor in the younger boys (P = 0.04). Occasional smokers not having divorced parents or mothers and siblings that smoked were independent significant factors among the younger girls (P = 0.04, P = 0.001, and P = 0.03) and among both boys (P = 0.03, P = 0.007, and P = 0.005) and girls (P = 0.006, P = 0.001, and P = 0.03) 16 years and older.

### Individual Factors (Tables 3A and 3B)
Occasional smoking girls of both age groups, and the oldest boys participated in more organized after school activities, more organized sports, more sport competitions, and harder exercise than daily smokers. In the younger age group, the occasional smoking boys and girls reported less social life without friends, and more often did at least 1 h of homework during the 7 days prior to answering the questionnaire compared to the daily smokers. No difference in social life with friends was found in the older age group. The oldest occasional smoking boys, but not girls, did more homework than daily smokers. No difference between smoking pattern and time spent watching television was found in the younger age group or the older boys. The older occasional smoking girls watched TV more often compared to daily smoking girls. Very few current smokers (9 aged 13–15 and 6 aged 16–18) had never tried to drink alcohol. In both age groups and sexes, occasional

### Table 2B
Odds of Being Occasional vs Daily Smoker by Environmental Factors for Adolescents Aged 16–18 Years*

<table>
<thead>
<tr>
<th></th>
<th>Occasional n (%)</th>
<th>Daily n (%)</th>
<th>OR (CI)</th>
<th>P</th>
<th></th>
<th>Occasional n (%)</th>
<th>Daily n (%)</th>
<th>OR (CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents not divorced</td>
<td>179 (82.5)</td>
<td>205 (72.7)</td>
<td>1.8 (1.1–2.7)</td>
<td>0.010</td>
<td>199 (80.2)</td>
<td>247 (68.1)</td>
<td>1.9 (1.3–2.8)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Never saw parents drunk</td>
<td>43 (20.4)</td>
<td>53 (21.9)</td>
<td>1.1 (0.7–1.7)</td>
<td>0.732</td>
<td>55 (22.2)</td>
<td>49 (13.7)</td>
<td>1.8 (1.2–2.7)</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Mother does not smoke</td>
<td>148 (68.2)</td>
<td>144 (51.1)</td>
<td>2.1 (1.4–3.0)</td>
<td>&lt;0.001</td>
<td>157 (63.3)</td>
<td>166 (46.0)</td>
<td>2.0 (1.5–2.8)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Father does not smoke</td>
<td>67 (30.9)</td>
<td>125 (44.3)</td>
<td>0.6 (0.4–0.8)</td>
<td>0.002</td>
<td>77 (31.0)</td>
<td>137 (38.0)</td>
<td>0.7 (0.5–1.0)</td>
<td>0.080</td>
<td></td>
</tr>
<tr>
<td>Siblings do not smoke</td>
<td>200 (92.2)</td>
<td>229 (81.2)</td>
<td>2.7 (1.5–4.9)</td>
<td>&lt;0.001</td>
<td>223 (89.9)</td>
<td>290 (80.3)</td>
<td>2.2 (1.3–3.6)</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

*Odds ratio (OR), 95% confidence interval (CI).

Note. Because missing data were excluded, the number of subjects varied for each factor.

*b % of occasional smokers, aged 16–18; boys n = 217, girls n = 248.

*c % of daily smokers, aged 16–18; boys n = 282, girls n = 361.
TABLE 3A
Odds of Being an Occasional Smoker vs Daily Smoker by Individual Factors for Adolescents Aged 13–15 Years*   

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occasional</td>
</tr>
<tr>
<td>Out with friends &lt; 2 times a week</td>
<td>28 (21.5)</td>
</tr>
<tr>
<td>Did homework &gt; 1 h &gt; 2 times a week</td>
<td>40 (37.7)</td>
</tr>
<tr>
<td>Watched TV &lt; 4 times a week</td>
<td>40 (31.5)</td>
</tr>
<tr>
<td>Never been drunk</td>
<td>31 (24.8)</td>
</tr>
<tr>
<td>Been drunk less than 10 times</td>
<td>103 (82.4)</td>
</tr>
<tr>
<td>Participate in organized activities</td>
<td>91 (69.5)</td>
</tr>
<tr>
<td>Participate in organized sports</td>
<td>74 (56.6)</td>
</tr>
<tr>
<td>Participate in sport competitions</td>
<td>60 (53.6)</td>
</tr>
<tr>
<td>Hard exercise ≥2 days a week</td>
<td>94 (71.8)</td>
</tr>
<tr>
<td>Plan for academic course in high school</td>
<td>35 (40.7)</td>
</tr>
<tr>
<td>Perceived good health</td>
<td>109 (83.2)</td>
</tr>
</tbody>
</table>

Note. Because missing data were excluded, the number of subjects varied for each factor.

* Odds ratio (OR), 95% confidence interval (CI).

% of occasional smokers, aged 13–15; boys n = 131, girls n = 210.
% of daily smokers, aged 13–15; boys n = 148, girls n = 130.

Smokers had been drunk less frequently than daily smokers.

In the age group 13–15 years, occasional smoking girls planned to enter higher academic courses in high school more often than daily smokers. In the older age group attending high school, both occasional smoking boys and girls participated in higher academic courses compared to daily smokers. Except for the youngest boys, occasional smokers reported having better health than daily smokers.

In multivariate analyses including the individual factors, occasional smokers being less often drunk (P = 0.004) and less often out with friends (P = 0.03) were independent significant factors in boys, while choosing higher academic courses in high school (P = 0.002), better perceived health (P = 0.006), and being less often drunk (P = 0.004) were influential in girls for the age group 13–15 years. In occasional smoking boys 16 years and older, higher academic courses (P < 0.001), more participation in organized activities (P = 0.02), more physical activity (P = 0.02), less drunkenness (P = 0.02), and more homework (P = 0.04) were independently influential. Compared to boys, doing more homework was not significant for the older girls, and occasional smokers participating more in organized sports (P = 0.004) was more influential than participation in organized activities in general.

TABLE 3B
Odds of Being an Occasional Smoker vs Daily Smoker by Individual Factors for Adolescents Aged 16–18 Years*  

<table>
<thead>
<tr>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occasional</td>
</tr>
<tr>
<td>Out with friends &lt; 2 times a week</td>
<td>49 (22.8)</td>
</tr>
<tr>
<td>Did homework &gt; 1 h &gt; 2 times a week</td>
<td>70 (32.9)</td>
</tr>
<tr>
<td>Watched TV &lt; 4 times a week</td>
<td>76 (55.7)</td>
</tr>
<tr>
<td>Never been drunk</td>
<td>5 (2.4)</td>
</tr>
<tr>
<td>Been drunk less than 10 times</td>
<td>50 (24.0)</td>
</tr>
<tr>
<td>Participate in organized activities</td>
<td>153 (71.2)</td>
</tr>
<tr>
<td>Participate in organized sports</td>
<td>82 (38.0)</td>
</tr>
<tr>
<td>Participate in sport competitions</td>
<td>69 (37.5)</td>
</tr>
<tr>
<td>Hard exercise ≥2 days a week</td>
<td>136 (63.0)</td>
</tr>
<tr>
<td>Academic course in high school</td>
<td>122 (58.9)</td>
</tr>
<tr>
<td>Perceived good health</td>
<td>188 (87.0)</td>
</tr>
</tbody>
</table>

Note. Because missing data were excluded, the number of subjects varied for each factor.

* Odds ratio (OR), 95% confidence interval (CI).

% of occasional smokers, aged 16–18; boys n = 131, girls n = 210.
% of daily smokers, aged 16–18; boys n = 148, girls n = 130.
DISCUSSION

This study confirms other studies showing cigarette smoking in youth increases with age, and is more common in girls [1,25]. Smoking prevalence was consistent with earlier studies from comparable countries [25], but somewhat lower than reported in recent studies of smoking trends [2,3]. Data from the National Council on Tobacco and Health, Norway [3], indicate that adolescent smoking prevalence in Nord-Trøndelag county is below the national average. Selective nonresponse by smokers cannot be excluded, although the participation rate in the present study was high (91%). The smoking history was self-reported and may be influenced by the veracity of the students. Some features of the study design foster truthful reporting. Confidentiality was stressed and no names were attached to the questionnaire. Smoking habits were not the focus of the study and were included with a variety of other items on somatic and mental health, quality of life and school features. In Norway, self-reported smoking habits have been found to be reliable in young adults [26]. In the present study, only nonsmokers wrongly reporting occasional smoking could be expected to increase differences between occasional and daily smokers, but it is not likely that nonsmokers would wrongly report occasional smoking. Other studies have shown the opposite, occasional smokers misclassified as nonsmokers [20].

Smoking Pattern

Studies have reported that occasional smoking is more common than daily smoking among 8th-graders, while daily smoking is more common among 12th-graders [2]. The present study showed that occasional smoking seemed to stabilize around age 15–16, while daily smoking was still increasing and became the dominant smoking pattern in both older boys and girls. This is in agreement with other reports that most adult daily smokers had smoked daily by age 18 [1], and emphasizes the importance of intervention at an early age.

One reason for the change in smoking pattern at age 16 might be the change of social environment from junior high to high school, as in Norway it is usual to start high school the year students turn 16. However, we found no difference between 16-year-old students attending junior high and 16-year-old students attending high school in regard to occasional and daily smokers (data not shown). The explanation could rather be that the attitude toward smoking changes with age or that the oldest students in junior high are more likely to socialize with older friends. Slightly fewer daily smokers in the 18-year-olds, compared to the 17-year-olds, might be a form of selection bias because 18-year-old students were more likely to be in academic classes. More quitters had been occasional smokers than daily smokers previous to quitting, consistent with cessation patterns reported elsewhere [22].

Individual and Environmental Factors

Logistic regression models confirmed the findings in the univariate models. Factors no longer significant when entered together in the multivariate models may be explained by intercorrelation. Since factors, although not significant in a regression model, may be important to smoking cessation, they are shown and discussed according to the univariate models.

Participation in organized activities and sports was more common in occasional smokers than daily smokers, compatible with other studies indicating that more nonsmokers than smokers participate in physical activity [1,15]. Whether this reflects selection of non-daily smokers into these activities or participation itself reduces smoking cannot be determined in a cross-sectional study. Encouraging participation in organized activities or organizing such activities could be tested as a method to prevent nonsmokers or occasional smokers from transitioning into daily smokers.

Occasional smokers doing more homework is consistent with their reporting more academic courses in school. The lack of difference for the oldest girls is unexplained, but girls may do more homework in general than boys. More time spent at home than out with friends among occasional smokers in the younger age group is concordant with the importance of parental monitoring in smoking progression of early initiators [13], or with peer pressure when young adolescents are unsupervised outside the home.

The close relationship between smoking and use of alcohol is well known [1]. Almost all youth in this study had tried alcohol, and most had been drunk. Nevertheless, the lower frequency of reported drunkenness by occasional smokers in both age groups and sexes suggests that the drinking pattern of occasional smokers is different from that of daily smokers.

Several studies have found that smoking initiation is associated with parental role models, disrupted families, low academic achievement, and limited educational plans [1]. In the present study occasional smokers differed from daily smokers in the same way. This is compatible with other studies showing that occasional smoking adults have higher education than daily smokers [27,28], and suggesting that a good quality social background and parental support are likely to lead smokers to quit or reduce smoking [1,29].

Smoking Transition

This study differs from previous studies in focusing on adolescent smokers and comparing those who are occasional smokers with daily smokers. It is expected that some of the adolescent occasional smokers who
are still experimenting will eventually become daily smokers [30]. However, stable occasional smokers and smokers who show no sign of nicotine dependence ("tobacco chippers") have been described in adults [23,27,28]. Prospective studies will be necessary to distinguish possibly different groups of occasional smokers.

Significantly lower debut age for both male and female daily smokers compared to occasional smokers indicates that many occasional smokers will become daily smokers. This may explain why no difference was found in social factors between occasional smokers and daily smokers in the younger boys. The gender difference in the younger age group may indicate that girls' early smoking is more influenced by social factors than boys'. The finding that more boys than girls quit daily smoking at a young age is compatible with this thesis. Girls' smoking pattern may also stabilize at an earlier age than boys'. Although the age trend supports the thesis that many occasional smokers will become daily smokers before adulthood, the observed differences between daily and occasional smokers in the present study may indicate that the adult pattern of occasional smoking [27,28] can also start at an early age. Studies involving twins have been interpreted to support a genetic component to daily addictive smoking [37].

Whether transitional or not, occasional adolescent smokers differed from daily smokers. This should be accounted for in cessation programs, and could make occasional adolescent smokers a special target group for several reasons. Occasional smoking is the strongest predictor for later daily smoking [30]. Preventing this transition would have a large personal and public health potential. Occasional smokers seem more likely to be in the contemplative stage needed to stop smoking with stronger support at home, better role models, and organized activities. This is in agreement with more occasional than daily smokers quitting smoking. Also, cessation programs for occasional smokers might be focused differently from daily smokers. For example, a more academic approach could be tried, and motivations other than health effects may be even more important in occasional smokers since they may perceive their health risk to be smaller than daily smokers. The gender difference seen in the younger age group indicates that an intervention in girls should start earlier than in boys, and the possible greater influence of social factors in young girls should be addressed. Support for stresses such as adjusting to parents' divorce might be helpful.

CONCLUSION

In this population-based study, approximately half of adolescents had tried smoking, and half of current smokers were occasional smokers. Occasional smokers were found to be in higher academic courses, to be more engaged in organized activities and sports, to have been less frequently drunk, and to have better family role models compared to daily smokers. Quitters were more likely to have been occasional than daily smokers. These findings suggest the potential utility of focusing on occasional smokers as a special target group in smoking cessation programs, and suggest that smoking cessation programs for occasional smokers may need a different focus than programs for daily smokers.

APPENDIX

<table>
<thead>
<tr>
<th>Question</th>
<th>Possible answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever tried smoking (at least one cigarette)?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>If yes, do you smoke?</td>
<td>Yes, I smoke ___ cig. daily, Yes, I smoke occa. but not daily</td>
</tr>
<tr>
<td></td>
<td>No, previously I smoked daily</td>
</tr>
<tr>
<td></td>
<td>No, previously I smoked occa.</td>
</tr>
<tr>
<td></td>
<td>No, I don't smoke</td>
</tr>
<tr>
<td>Does anyone in your home smoke?</td>
<td>No, Academic</td>
</tr>
<tr>
<td>What study courses do you take? (for high school students)</td>
<td>Yes, mother, Nonacademic</td>
</tr>
<tr>
<td>What study courses do you plan to take in high school? (for junior high school students)</td>
<td>Yes, father, Yes, siblings</td>
</tr>
<tr>
<td>Are your parents divorced or have they been separated for more than a year?</td>
<td>No, Yes, divorced/ separated, Yes, once</td>
</tr>
<tr>
<td>Have you ever had so much alcohol that you have been drunk?</td>
<td>Yes, 2–3 times</td>
</tr>
<tr>
<td></td>
<td>Yes, 4–10 times</td>
</tr>
<tr>
<td></td>
<td>Yes, &gt; 10 times</td>
</tr>
<tr>
<td>Have you ever seen your parents drunk?</td>
<td>Never, A few times</td>
</tr>
<tr>
<td>How many organized activities do you participate in? (as music, sport, scouts etc.)</td>
<td>None, One, Two or more</td>
</tr>
<tr>
<td></td>
<td>Every month, Every week</td>
</tr>
</tbody>
</table>
### APPENDIX—Continued

<table>
<thead>
<tr>
<th>Question</th>
<th>Possible answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you participate in active (organized) sports? 5</td>
<td>Yes, No, I have quit, No</td>
</tr>
<tr>
<td>Do you participate in sports competitions? 5</td>
<td>Yes, No, I have quit, No</td>
</tr>
<tr>
<td>How many days a week (outside school hours) do you exercise until sweaty or breathless? 6</td>
<td>Every day, 4–6 d, 2–3 d, One d, Every 14 d, Every month</td>
</tr>
<tr>
<td>Think of the last 7 days, about how many times did you do any of the below listed:</td>
<td>None, One time, 2–3 times, ≥4 times</td>
</tr>
<tr>
<td>Were out with friends more than two hours at a time? 7</td>
<td>None, One time, 2–3 times, ≥4 times</td>
</tr>
<tr>
<td>Did homework for more than one hour? 7</td>
<td>None, One time, 2–3 times, ≥4 times</td>
</tr>
<tr>
<td>Watched TV or video? 7</td>
<td>None, One time, 2–3 times, ≥4 times</td>
</tr>
<tr>
<td>How is your health right now? 8</td>
<td>Very good, Good, Not good, Bad</td>
</tr>
</tbody>
</table>

Questions with more than two possible answering alternatives were dichotomized into:
1. Yes, “divorced-separated” and “No.” Students with parents that had moved together again were excluded.
2. “Never” and “Once/2–3/4–10/10 or more” and “Several times/2–3/4–10 times” and “≥ 10 times.”
3. “Never” and “A few times/yearly/every month/yearly month.”
4. “None” and “One/two or more.”
5. “Yes” and “No/no, quit.”
6. “Every day/4–6/7–9 days.” and “One day/every 14 days/month/less—never.”
7. “None/one” and “2–3/4–2/4 times.”
8. “Very good/good” and “not good/bad.”

### ACKNOWLEDGMENTS

The authors gratefully acknowledge the contributions of Bitte Dillan, Grete Bratberg Ross, Aina Eines, Inger Duvaute Holbe, and the project nurses.

### REFERENCES


Appendices

Appendix 1: Questionnaire for junior high (13-16 years) and high school (16-19 years) in Norwegian and English

Appendix 2: Definitions, groupings and dichotomization of variables used in Papers I-IV

Questions from the interview used in this thesis

Appendix 3: Written information to participants and parents

Appendix 4: Written consents from adolescents and parents

Appendix 5: Instructions to teachers

Appendix 6: Tables and figures
Appendix 1

Questionnaires for junior high (13-16 years) and high school (16-19 years) in Norwegian

Pages 2 to 22 in the two versions were identical. Therefore only the front and back pages and pages 1 and 22 in the high school questionnaire are reprinted

Questionnaire for high school (16-19 years) in English
Nå er det din tur til å delta i den store helseundersøkelsen i Nord-Trøndelag (hunt)!

Vi håper du har lest igjennom informasjonen du fikk med hjem om ung-hunt og bestemt deg for å være med!


Navnet ditt skal IKKE være med på spørreskjemaet!


Alle svarene dine blir behandlet med taushetsplikt!

Ingen på skolen får se svarene dine.

Hvis du ønsker å snakke med noen om undersøkelsen, kan du ta kontakt med ung-hunt-sykepleieren på skolen din eller ringe Folkehelsa i Verdal (se baksiden).

Lytte til og tusen takk!
Dato for utfylling av skjema: ___ / ___ 19___

1. Er du gutt eller jente?  
   Gutt ☐  Jente ☐

2. Hvilken klasse går du i?  
   7. klasse ☐  
   8. klasse ☐  
   9. klasse ☐

3. Hvilke planer for videre utdanning har du?  
   (Sett ett eller flere kryss)  
   * Ingen ☐  
   * Videregående allmennfag ☐  
   * Videregående yrkesfag ☐  
   * Høgskole eller universitet mindre enn 4 år ☐
   * Høgskole eller universitet 4 år eller mer ☐  
   * Annen yrkesutdanning ☐  
   * Vet ikke ☐

OM DER DU BOR

4. Hvilken type bolig (hus) bor du i?  (Sett bare ett kryss)  
   * Enebolig/villa ☐  
   * Blokk/terasseleilighet ☐  
   * Gardsbruk ☐  
   * Rekkehus/2-4 mannsbolig ☐  
   * Annen bolig ☐

5. Hvem bor du sammen med nå?  (Her kan du sette ett eller flere kryss)  
   * Mor ☐  
   * Far ☐  
   * 1-2 søsken ☐  
   * 3 eller flere søsken ☐  
   * Mors nye mann eller samboer ☐  
   * Fars nye kone eller samboer ☐  
   * Alene/på hybel ☐  
   * Fosterforeldre ☐  
   * Andre ☐

6. Er det heldekkende tepper (teppegulv) hjemme hos deg:  
   - i stua?  Ja ☐  Nei ☐  
   - på soverommet ditt?  Ja ☐  Nei ☐

7. Er det katt i boligen (hjemme hos deg)?  Ja ☐  Nei ☐

8. Er det hund i boligen (hjemme hos deg)?  Ja ☐  Nei ☐

9. Er det andre pelskledde dyr i boligen (hjemme hos deg)?  Ja ☐  Nei ☐
## OM HELSA DI

### 10. Hvordan er helsa di nå? (Sett ett kryss for det som passer for deg)

- Dårlig ........................................ [ ]
- Ikke helt god ................................ [ ]
- God ........................................... [ ]
- Svært god .................................... [ ]

### 11. Er du funksjonshemmet på noen av disse måtene?
(Se sett kryss på hver linje)

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<thead>
<tr>
<th></th>
<th>Nei</th>
<th>Litt</th>
<th>Middels</th>
<th>Mye</th>
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<tbody>
<tr>
<td><em>Er bevegelseshemmet</em></td>
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<td><em>Har nedsatt hørsel</em></td>
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<td><em>Hemmet pga. kroppslig sykdom</em></td>
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<td><em>Hemmet pga. psykiske plager</em></td>
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### 12. Har du hatt noen av disse plagene i løpet av de siste 12 månedene?
(Se sett kryss på hver linje)

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<td><strong>A Hodepine (uten kjent medisinsk årsak)</strong></td>
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<td><strong>B Nakke og skuldersmerter</strong></td>
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<td><strong>C Ledd og muskelmerter</strong></td>
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<td><strong>D Magesmerter (uten kjent medisinsk årsak)</strong></td>
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<td><strong>E Kvalme</strong></td>
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<td><strong>G Diare, magesyke</strong></td>
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<td><strong>H Hjertebank</strong></td>
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<td><strong>I Bronkitt eller lungebetennelse</strong></td>
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<td><strong>J Ørebetennelse</strong></td>
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### 13. Hvis du har svart «aldri» på alle plagene nevnt ovenfor: Har du hatt noen av disse plagene ofte tidligere (dvs. før de siste 12 månedene)?

- Ja [ ]
- Nei [ ]

_Hvis ja: Hvilke plagers (se ovenfor) var det? (Skriv navn eller bokstavene ovenfor som passer)_

__________________________________________________________________________________________
14. Har du noen gang hatt tung pust eller piping/surkling/tetthet i brystet?
   Ja ☐ Nei ☐

**HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 19**

15. Har du hatt tung pust eller piping/surkling/tetthet i brystet i løpet av de siste 12 månedene?
   Ja ☐ Nei ☐

**HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 19**

16. Hvor mange anfall med tung pust eller piping/surkling/tetthet i brystet har du hatt i løpet av de siste 12 månedene?
   Ingen ☐ 1 til 3 ☐ 4 til 12 ☐ Mer enn 12 ☐

17. Hvor ofte i gjennomsnitt har søvnen din blitt forstyrret p.g.a. tung pust eller piping/surkling/tetthet i brystet de siste 12 månedene?
   Aldri våknet ☐ Mindre enn en natt pr. uke ☐ En eller flere netter pr. uke ☐

18. Har piping/surkling/tetthet i brystet eller tung pust vært så alvorlig de siste 12 månedene at du har hatt problemer med å snakke, slik at du bare har kunnet si ett eller to ord mellom hver pust?
   Ja ☐ Nei ☐

************************************************************************

19. Har du noen gang hatt astma?
   Ja ☐ Nei ☐

Hvis ja:
   Har lege sagt du har hatt astma?
   Ja ☐ Nei ☐
20. Har du i løpet av de siste 12 månedene hatt tung pust eller piping/surkling/tetthet i brystet under eller etter fysisk trening, aktiv lek eller mosjonering?  
   Ja □  Nei □

21. Har du i løpet av de siste 12 månedene hatt tørr hoste om natten uten å være forkjølet eller ha annen luftveisinfeksjon?  
   Ja □  Nei □

OM UTSLETT

22. Har du noen gang hatt kløsende utsett som har kommet og gått i minst 6 måneder?  
   Ja □  Nei □

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 27

23. Har du noen gang hatt dette kløsende utsettet i løpet av de siste 12 månedene?  
   Ja □  Nei □

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 27

24. Har dette kløsende utsettet noen gang sittet på noen av de følgende stedene: aluebøyene (på innsiden), bak knærne, foran på ankle, under baken eller rundt hals, ører eller øyne?  
   Ja □  Nei □

25. Har dette utsettet vært helt borte noen gang i løpet av de siste 12 månedene?  
   Ja □  Nei □

26. I løpet av de siste 12 månedene, hvor ofte i gjennomsnitt har du blitt holdt våken om natten på grunn av dette kløsende utsettet?  
   * Ingen ganger de siste 12 månedene ........................................... □
   * Mindre enn en natt per uke .......................................................... □
   * En eller flere netter per uke ...................................................... □

************************************************************************************

27. Har du noen gang hatt eksem?  
   Ja □  Nei □
OM NESEPLAGER

Alle spørsmålene er om problemer som oppstår når du IKKE er forkjølet eller har influensa.

28. Har du noen gang hatt problemer med nysing eller tett eller rennende nese når du IKKE har vært forkjølet eller har hatt influensa?
   Ja ☐ Nei ☐

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 33

29. I løpet av de siste 12 månedene, har du da hatt problemer med nysing, rennende eller tett nese uten å ha vært forkjølet eller å ha hatt influensa?
   Ja ☐ Nei ☐

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 33

30. I løpet av de siste 12 månedene, har disse neseproblemene vært ledsaget av kløende, rennende øyne?
   Ja ☐ Nei ☐

31. I hvilke av de siste 12 månedene har du hatt neseproblemene?
   (Sett ett kryss for hver måned som passer)
   * Januar .... ☐ * Mai .......... ☐ * September .......... ☐
   * Februar .... ☐ * Juni .......... ☐ * Oktober .......... ☐
   * Mars .......... ☐ * Juli .......... ☐ * November .......... ☐
   * April .......... ☐ * August .... ☐ * Desember .......... ☐

32. I løpet av de siste 12 månedene, hvor mye har disse neseproblemene virket inn på din daglige aktivitet?
   Ikke i det hele tatt ☐ Litt ☐ Mye ☐ Veldig mye ☐

........................................................................................................................................

33. Har du noen gang hatt høysnue eller neseallergi?
   Ja ☐ Nei ☐

OM ALLERGI

34. Er du allergisk?
   Ja ☐ Nei ☐ Vet ikke ☐

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 37
35. **Hva kjenner du selv at du er allergisk for?** Kryss av for hva slags plager du har for hver ting. (Sett ett eller flere kryss for hver linje)

<table>
<thead>
<tr>
<th></th>
<th>Ingen plager</th>
<th>Neseplager</th>
<th>Øyeplager</th>
<th>Eksemplager</th>
<th>Mageplager</th>
<th>Astma/pusteplager</th>
<th>Annet</th>
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36. **Har du tatt allergitest hos lege (blodprøve, hudtest)?**  

- Ja □  
- Nei □

---

**OM MEDISINER**

37. **Bruker du noen av disse medisinene eller kosttilskuddene?**  
Tenk på hva du bruker medisinene for. (Sett ett kryss for hver linje)

<table>
<thead>
<tr>
<th>Medisiner</th>
<th>Aldri</th>
<th>Av og til</th>
<th>Nesten daglig</th>
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</thead>
<tbody>
<tr>
<td><em>Smerterstillende medisin</em></td>
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<tr>
<td><em>Migrenemedisin</em></td>
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<td><em>Sovemedisin</em></td>
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<tr>
<td><em>Neremedisin</em></td>
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<td><em>Beroligende medisin</em></td>
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<td><em>Astmamedisin</em></td>
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<td><em>Allergimedisin</em></td>
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<td><em>Eksemsalve</em></td>
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<td><em>Avføringstabletter</em></td>
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<td><em>Jerntabletter</em></td>
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<td><em>Vitamintilskudd</em></td>
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<td><em>Tran</em></td>
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<tr>
<td><em>Homöopatmedisin, naturmedisin</em></td>
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<td><em>Annet</em></td>
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Hvis annet, hva ___________________________________________
OM ANDRE SYKDOMMER

38. Har lege sagt at du har:
   * Epilepsi .........................................................
   * Diabetes (sukkersyke) ......................................
   * Migrene ..........................................................
   Ja ☐ Nei ☐
   ☐ ☐ ☐

39. Har du noen andre sykdommer som har vart over 3 måneder?
   Ja ☐ Nei ☐
   Hvilke(n) ?

OM TOBAKK

40. Røyker noen hjemme hos deg? (Sett ett eller flere kryss)
   * Nei, ingen ☐
   * Ja, mor .... ☐
   * Ja, far .... ☐
   * Ja, søsken .......... ☐
   * Ja, andre .......... ☐

41. Har du prøvd å røyke? (minst en sigarett)
   Ja ☐ Nei ☐

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 45

42. Røyker du selv?
   (Sett ett kryss og oppgi evtl. antall sigaretter.
   En pakke tobakk er ca. 50 sigaretter)
   Ja, jeg røyker ca ___ sigaretter daglig ☐
   Ja, jeg røyker av og til, men ikke daglig ☐
   Nei, ikke nå, men tidligere røykte jeg av og til ☐
   Nei, ikke nå lenger, men tidligere røykte jeg ca ___ sigaretter daglig ☐
   Nei, jeg røyker ikke ☐

HVIS DU HAR SVART «NEI, JEG RØYKER IKKE»: GÅ TIL SPØRSMÅL 45

43. Hvor gammel var du da du begynte å røyke?
   ____ år

44. Hvor mange år tilsammen har du røykt daglig?
   ____ år
45.  Blir du noen gang sjenert av røyklukt:
     - på skolen? ................................................... □  □  □  □
     - hjemme? ................................................... □  □  □  □

46.  Bruker du eller har du brukt snus, skrå eller lignende?
     Nei, aldri □  Ja, men jeg har sluttet □  Ja, av og til □  Ja, hver dag □

HVIS DU HAR SVART «NEI, ALDRI»: GÅ TIL SPØRSMÅL 50

47.  Hvor gammel var du da du begynte med snus/skrå? _____ år

48.  Hvor mange år til sammen har du brukt snus/skrå? _____ år

49.  Hvor mange esker/poser snus/skrå bruker/brukte du i uka? _____ antall

OM IDRETT OG MOSJON

50.  Utenom skoletida: Hvor mange dager i uka driver du idrett, eller mosjonerer du så mye at du blir andpusten og/eller svett?
     (Sett bare ett kryss)
     * Hver dag .............  □  * Ikke hver uke, men minst en dag hver 14. dag  □  □
     * 4-6 dager i uka ..  □  * Ikke hver 14. dag, men minst en dag i måneden .. □  □
     * 2-3 dager i uka ..  □  * Sjeldnere enn en dag i måneden ................. □  □
     * 1 dag uka ...........  □  * Aldri .................................................. □  □

51.  Utenom skoletida: Til sammen hvor mange timer i uka driver du idrett eller mosjonerer du så mye at du blir andpusten og/eller svett?
     (Sett bare ett kryss)
     * Ingen ............... □  * Omtrent 2-3 timer ........................................... □  □
     * Omtrent ½ time .. □  * Omtrent 4-6 timer ........................................... □  □
     * Omtrent 1 time ... □  * 7 timer eller mer ...................................... □  □

52.  Bruker du astma-medisin før mosjon, trening eller idrettskonkurranser?
     Ja □  Nei □
53. Driver du aktiv idrett?
   Ja ☐
   Nei, men jeg drev med aktiv idrett før ☐
   Nei ☐

**HVIS DU HAR SVART «NEI» (aldri drevet aktiv idrett): GÅ TIL SPØRSMÅL 59**

54. Hvis du har sluttet: Hvor gammel var du da du sluttet med aktiv idrett? ___år

55. Hvilke(n) idrett(er) er/vari du med i? (Sett ett eller flere kryss)
   A Ski (langrenn, skiskyting) ☐
   B Ski (slalåm, hopp) ☐
   C Fotball ☐
   D Riding ☐
   E Skeyter, ishockey ☐
   F Håndball, basket, volleyball ☐
   G Kampidrett, bokning ☐
   H Bodybuilding ☐
   I Sykling ☐
   J Styrkeløft/vektløfting ☐
   K Friidrett/løp/orientering ☐
   L Svømning ☐
   M Gymnastikk/tum ☐
   N Annel ☐
   Hva? ☐

56. Deltar du i idrettskonkurranser, kamper? (Sett ett kryss)
   Ja ☐
   Nei, men jeg deltok før ☐
   Nei ☐

**HVIS DU HAR SVART «NEI» (aldri deltatt i konkurranser, kamper): GÅ TIL SPØRSMÅL 59**

57. På hvilket nivå deltok/deltar du i idrettskonkurranser? (Angi høyeste nivå)
   * Lokalt nivå ☐
   (klubbmesterskap, serier etc.) ☐
   * Kretsnivå ☐
   * Nasjonalt nivå (landsstevne, Norgesmesterskap) ☐

58. I hvilke(n) idrett(er) er/var dette? (Skriv inntil 3 idretter du er/var mest med på)
   Jeg er/har vært mest aktiv i....................................og har holdt på med dette i ...............år
   Jeg er/har vært nest mest aktiv i....................................og har holdt på med dette i ...............år
   Jeg er/har vært 3. mest aktiv i....................................og har holdt på med dette i ...............år
59. Når du tenker på hvordan du har det for tida, er du stort sett fornøyd eller er du stort sett misfornøyd? (Sett bare ett kryss)

* Svært fornøyd .................. ☐  * Nokså misfornøyd .......... ☐
* Meget fornøyd .................. ☐  * Meget misfornøyd .......... ☐
* Ganske fornøyd .................. ☐  * Svært misfornøyd .......... ☐
* Både og .......................... ☐

60. Føler du deg stort sett sterk og opplagt eller trøtt og sliten? (Sett bare ett kryss)

* Meget sterk og opplagt .......... ☐  * Ganske trøtt og sliten ... ☐
* Sterk og opplagt ............... ☐  * Trøtt og sliten ............... ☐
* Ganske sterk og opplagt. ........ ☐  * Svært trøtt og sliten ....... ☐
* Både og .......................... ☐

61. Er du vanligvis glad eller nedstemt (trist)? (Sett bare ett kryss)

* Svært nedstemt (trist) ....... ☐  * Nokså glad ....................... ☐
* Nedstemt (trist) ............... ☐  * Glad ............................. ☐
* Nokså nedstemt (trist) ... ☐  * Svært glad ....................... ☐
* Både og .......................... ☐

62. Hva slags oppfatning har du av deg selv? Kryss av hver av setningene under ettersom du er enig eller uenig i at de passer for deg. (Ett kryss for hver linje)

* Jeg har en positiv holdning til meg selv .............. ☐ ☐ ☐ ☐
* Jeg føler meg virkelig ubrukelig til tider ............. ☐ ☐ ☐ ☐
* Jeg føler at jeg ikke har mye å være stolt av .... ☐ ☐ ☐ ☐
* Jeg føler at jeg er en verdifull person, i hvert fall på lik linje med andre ......................... ☐ ☐ ☐ ☐

63. Har du i løpet av den siste måneden:

* hatt vanskelig for å sovne inn? ............ ☐ ☐ ☐ ☐
* våknet for tidlig og ikke sovnet igjen?. ☐ ☐ ☐ ☐
64. Spørsmålene nedenfor dreier seg om hvordan du vanligvis opptrer, føler og handler. Kryss av det som passer best, enten Ja eller Nei for hver linje.

* Er du forholdsvis livlig? ..................................................  □  □
* Ville du bli oppskaket av å se et barn eller dyr lide? ........... □  □
* Liker du å treffe nye mennesker? ................................... □  □

* Bli dine følerne lett såret? .................................................. □  □
* Hender det ofte at du «går trøtt»? ............................... □  □
* Liker du å spille andre et puss som av og til kan såre dem? .. □  □

* Er du ofte bekymret? .......................................................... □  □
* Er gode manøver og renskraft viktig for deg? .................. □  □
* Bekymrer du deg for at fryktelige ting kan skje? ............. □  □

* Tar du vanligvis selv det første skrittet for å få nye venner? .. □  □
* Er du for det meste stille når du er sammen med andre? .... □  □
* Liker du å komme til avtaler i god tid? ............................ □  □

* Har du ofte følt deg trøtt og giddeslaus uten grunn? .......... □  □
* Er det mange mennesker som forsøker å unngå deg? ....... □  □
* Klærer du å holde fart i et selskap? .................................. □  □

* Bekymrer du deg for lenge etter en pinlig opplevelse? ...... □  □
* Liker du å ha masse liv og røre rundt deg? ....................... □  □
* Forteller folk deg en masse løgener? ................................ □  □

65. Nedenfor er en liste over noen problemer eller plager. Har du vært plaget av noe av dette de siste 14 dagene? (Se ett kryss for hver linje)

<table>
<thead>
<tr>
<th>Ikke plaget</th>
<th>Litt plaget</th>
<th>Ganske plaget</th>
<th>Veldig plaget</th>
</tr>
</thead>
</table>
* Vært stadig redd og engstelig .................. □  □  □  □
* Følt deg anspent eller urolig .................. □  □  □  □

* Følt håploshet når du tenker på framtida □  □  □  □
* Følt deg nedfor eller trist ....................... □  □  □  □

* Bekymret deg for mye om forskjellige ting □  □  □  □

66. Har du i løpet av den siste måneden vært plaget av nervøsitet (irritabel, urolig, anspent eller rastløs)?

Nesten hele tida □  □  □  □
Ofte □  □  □  □
Av og til □  □  □  □
Aldri □  □  □  □
OM FRITIDA

67. Tenk tilbake på den siste uka, altså de 7 siste dagene. Hvis du gjorde noe som står på lista nedenfor, omtrent hvor mange ganger gjorde du det? (Sett ett kryss for hvert punkt med stjerne)

* Besøkte noen du kjente ........................................... □ □ □ □
* Fikk besøk .................................................................. □ □ □ □
* Leste en bok du likte .................................................. □ □ □ □

* Hørte på musikk eller spilte et instrument lengre enn et kwarter av gangen .................. □ □ □ □
* Var ute mer enn 2 timer av gangen med kamerater eller venninner .............................. □ □ □ □
* Var på møte eller trenin i en forening eller et lag .................................................. □ □ □ □

* Drev med en annen hobby ........................................... □ □ □ □
* Så på TV eller video ................................................... □ □ □ □
* Gjorde lekser eller hjemmearbeid lengre enn en time .................................................. □ □ □ □

68. Hvor mange lag eller foreninger er du med i? (f.eks. idrettslag, speiderforening, musikk-korps el.)

Ingen □ En □ To eller flere □

OM VENNER

69. Har du hatt noen som du har regnet som din beste venn gjennom mesteparten av skoletiden?

Ja □ Nei □

70. Hender det at du føler deg ensom? (Sett ett kryss)

* Svært ofte ............. □
* Ofte .................. □
* Av og til ............. □

* Sjelden .................................................. □
* Svært sjelden eller aldri .................. □
71. Er dine foreldre separat eller skilt, eller har de noen gang flyttet fra hverandre for mer enn ett år? (Sett ett kryss og evt. alderen din)
   * Nei ........................................................................................................... □
   * Ja, de flyttet fra hverandre eller ble separat da jeg var _____ år, men flyttet senere sammen igjen ................................................................. □
   * Ja, de ble skilt eller flyttet fra hverandre for godt da jeg var _____ år ........ □

72. Hvis du har søskener, hvor godt forhold føler du at du har til søstersen eller broren din? Hvis du har flere søskener, tenk på den du har det beste forholdet til. (Sett ett kryss)
   * Mye dårligere enn vanlig ............ □
   * Dårligere enn vanlig .................. □
   * Som vanlig ................................ □
   * Bedre enn vanlig ............... □
   * Mye bedre enn vanlig ...... □
   * Har ikke søskere ................... □

   * Ingen .................................................. □
   * En .................................................... □
   * 2 eller flere ............................. □
   * 4 eller flere ............................. □

74. Har du fast kjæreste?  
    Ja □  Nei □

75. Føler du at du har mange nok venner?  
    Ja □  Nei □
### OM SKOLEN

76. **Hender noe av dette deg på skolen, eller har det hendt før?** (Sett ett kryss for hvert punkt med stjerne)

<table>
<thead>
<tr>
<th><em>Har vanskelig for å konsentrere deg i timen</em></th>
<th>Aldri</th>
<th>En gang i blant</th>
<th>Ofte</th>
<th>Svært ofte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synes gym eller formningstimene er morsomme</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synes andre timer er morsomme</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krangler med læreren</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gleder deg til å gå skolen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skulker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forstår når lærerne underviser</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Har det morsomt i friminuttene</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Er fornøyd med resultatene på prøver</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kommer i slåsskamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blir mobbet av andre elever</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Får skjenn av læreren</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klarer ikke å være rolig i timene</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kjeder deg, eller mistrives</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OM KOSTHOLD OG SPISEVANER

77. **Hvor ofte spiser du til vanlig disse måltidene?** (Sett ett kryss for hver linje)

<table>
<thead>
<tr>
<th><em>Frokost</em></th>
<th>Hver dag</th>
<th>4-6 dg i uka</th>
<th>1-3 dg i uka</th>
<th>Sjeldnere eller aldri</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Formiddagsmat/ nistepakke</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Varm middag</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 78. **Prøver du å slanke deg?**

- Nei, vekten min er passe
- Nei, men jeg trenger å slanke meg
- Ja
79. Hvor ofte hender det at du **ikke** spiser matpakken selv om du har den med? (Sett ett kryss)

* Hver skoledag .................. ☐
* 1-3 dager i uka .................. ☐
* 4-6 dager i uka .................. ☐
* Sjeldnere eller aldri ............. ☐
* Har aldri med matpakke .... ☐

80. Hvor ofte drikker du eller spiser du noe av dette? (Sett ett kryss for hver linje)

<table>
<thead>
<tr>
<th></th>
<th>Mer enn 1 gang pr. dag</th>
<th>En gang pr. dag</th>
<th>Hver uke, men ikke hver dag</th>
<th>Sjeldnere</th>
<th>Aldri</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Cola, brus eller andre lesnedrikker .........................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Lettmelk/skummet melk ......................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Helmelk ........................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Kaffe ..........................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Potetgull o.l ..................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Sukkertøy, sjokolade, andre søtsaker ........................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Pommes frites, hamburger, peolser .................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Grovt brød/knekkebrød .......................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Meieriismer .....................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Margarin .........................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Frukt ...........................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>* Grønnsaker .....................................................</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

81. Vil du si om deg selv at du er: (Sett ett kryss)

* Svaert tykk .................. ☐
* Litt tykk .......................... ☐
* Omtrent som andre ........... ☐
* Heller tynn .................. ☐
* Svaert tynn .................. ☐
82. **Nedenfor er en liste over ting som gjelder spisevaner. Kryss av for hva som passer deg. (Sett ett kryss for hvert punkt med stjerne)**

<table>
<thead>
<tr>
<th>* Når jeg først har begynt å spise, kan det være vanskelig å stoppe</th>
<th>Aldri</th>
<th>Sjelden</th>
<th>Ofte</th>
<th>Alltid</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Jeg bruker for mye tid til å tenke på mat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Jeg føler at maten kontrollerer livet mitt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Når jeg spiser, skjærer jeg maten opp i små biter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Jeg bruker lengre tid enn andre på et måltid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Eldre mennesker synes at jeg er for tynn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Jeg føler at andre presser meg til å spise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OM ALKOHOL**

83. **Har du noen gang prøvd å drikke alkohol ? (Dvs. alkoholholdig øl, vin, brennevin eller hjemmebrent)**

<table>
<thead>
<tr>
<th>Ja</th>
<th>Nei</th>
<th>Vet ikke</th>
</tr>
</thead>
</table>

**HVIS DU HAR SVART «NEI» , GÅ TIL SPØRSMÅL 87**

84. **Har du noen gang drukket så mye alkohol at du har vært beruset (full) ?**  
(Sett ett kryss)

| * Nei, aldri      |       |
| * Ja, en gang    |       |
| * Ja, 2-3 ganger |       |
| * Ja, 4-10 ganger|       |
| * Ja, mer enn 10 ganger | |

85. **Omtrent hvor mye øl, vin eller brennevin drikker du vanligvis i løpet av to uker ?**  
Regn ikke med alkoholfritt øl. Sett 0 hvis du ikke drikker.

<table>
<thead>
<tr>
<th>Øl</th>
<th>antall ½ flaske</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Brennevin</th>
<th>antall glass (ca ½ dl)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Vin</th>
<th>antall glass (ca 1 dl)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hjemmebrent</th>
<th>antall glass (ca ½ dl)</th>
</tr>
</thead>
</table>
86. På hvilke ukedager drikker du som oftest alkoholholdige drikker?  
(Sett ett eller flere kryss)

* Drikker ikke .......... □  
* Fredager .......... □  
* Andre dager i uken ........ □  
* Lørdager .......... □  

87. Har du noen gang sett at noen av dine foreldre har vært beruset?  
(Sett ett kryss)

* Aldri .................. □  
* Noen få ganger .. □  
* Noen ganger i året .................. □  
* Noen ganger i måneden ........ □  
* Noen ganger i uka .................. □  

88. Hvor ofte føler du at din lese- og skriveferdighet er utilstrekkelig for de oppgavene du skal gjøre på skolen og /eller i fritiden?

<table>
<thead>
<tr>
<th>Aldri</th>
<th>Nesten aldri</th>
<th>Noen ganger</th>
<th>Ofte</th>
<th>Alltid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Lesing □ □ □ □ □  
* Skriving □ □ □ □ □  

89. Har du hatt spesielle lese- eller skriveproblemer de siste 12 månedene?

<table>
<thead>
<tr>
<th>Store problemer</th>
<th>Noen problemer</th>
<th>Ingen problemer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Lesing .............. □  
* Skriving .............. □  

90. Får du hjelp for lese- eller skriveproblemer nå?  
    Ja □  
    Nei □  

91. Har du hatt lese- eller skriveproblemer tidligere,  
    men ikke de siste 12 månedene?

    Ja □  
    Nei □  

    Hvis ja, fikk du hjelp den gangen?

    Ja □  
    Nei □  


92. Har du noen form for talevansker?  

<table>
<thead>
<tr>
<th>Ja</th>
<th>Nei</th>
</tr>
</thead>
</table>

Hvis ja: hvilke:

* Stammer ...........................................  
* Uttalevansker .....................................  
* Stemmevansker .....................................  
* Vansker med å uttrykke meg ....................

---

**OM HELSETJENESTEN**

93. Har du i løpet av de siste 12 månedene vært hos: (Ett kryss på hver linje)

<table>
<thead>
<tr>
<th>Ja</th>
<th>Nei</th>
</tr>
</thead>
</table>

* Allmennpraktiserende lege (lege utenom sykehus)  
* Lege på sykehus (uten at du var innlagt)  
* Psykolog  
* Fysioterapeut  
* Kiropraktor  
* Homöopat  
* Annen behandler (naturmedisiner, fotsoneterapeut, håndspålegger, «healer», «synsk», e.l.)

94. Har du noen gang vært innlagt på sykehus (utenom da du ble født)?

<table>
<thead>
<tr>
<th>Nei, aldri</th>
<th>Ja, en gang</th>
<th>Ja, mer enn en gang</th>
</tr>
</thead>
</table>

Hvis ja: Har du vært innlagt på sykehus i løpet av de siste 12 månedene?

<table>
<thead>
<tr>
<th>Ja</th>
<th>Nei</th>
</tr>
</thead>
</table>

95. Hvor ofte har du vært hos skolehelsetjenesten de siste 12 månedene?

<table>
<thead>
<tr>
<th>Ingen ganger</th>
<th>1 - 3 ganger</th>
<th>Mer enn 3 ganger</th>
</tr>
</thead>
</table>

96. Har du selv noen gang tatt kontakt med skolehelsetjenesten?

<table>
<thead>
<tr>
<th>Ja</th>
<th>Nei</th>
</tr>
</thead>
</table>

97. Ønsker du deg mer kontakt med skolehelsetjenesten enn det du har hatt?

<table>
<thead>
<tr>
<th>Ja</th>
<th>Nei</th>
</tr>
</thead>
</table>
98. Hvor ofte har du vært borte fra skolen p.g.a. sykdom de siste 12 månedene?

- Mindre enn en uke
- 1-2 uker
- Mer enn 2 uker

**OM UTVIKLING**

Du er nå i en alder da kroppen din kan ha begynt å forandre seg og bli mer og mer lik kroppen til en voksen. Her er det noen spørsmål om kroppelige forandringer som skjer med ungdemmer i din alder.

99. Når man er tenåring, er det perioder da man vokser raskt. Har du merket at kroppen din har vokst fort (blitt høyere)? (Sett ett kryss)

- Nei, den har ikke begynt å vokse
- Ja, den har såvidt begynt å vokse raskt
- Ja, den har helt tydelig begynt å vokse
- Ja, det virker som om jeg er ferdig med å vokse raskt

100. Og hva med hår på kroppen (under armene og i skrittet)? Vil du si at håret på kroppen din har: (Sett ett kryss)

- Ikke begynt å vokse enda
- Såvidt begynt å vokse
- Helt tydelig begynt å vokse
- Det virker som om håret på kroppen er utvokst

101. Når du ser på deg selv nå, mener du at du er/vari tidligere eller senere fysisk moden enn andre på din alder? (Sett ett kryss)

- Mye tidligere
- Noe tidligere
- Lite grann tidligere
- Akkurat som andre
- Lite grann senere
- Noe senere
- Mye senere
102. Har du begynt å få bryster? (Sett ett kryss)
   * Nei, har ikke begynt ennå □
   * Ja, har helt tydelig begynt □
   * Ja, har såvidt begynt □
   * Det virker som om brystene er fullt utviklet □

103. Har du fått menstruasjon («mensen»)?
   Ja □
   Nei □

HVIS DU HAR SVART «NEI»: GÅ TIL SPØRSMÅL 106

104. Hvor gammel var du da du fikk din første menstruasjon?
   Jeg var ..........år og ..........måneder.

105. Har du noen gang etter en blødning vært blødningsfri i flere måneder (uten å ha vært gravid)? (Sett ett kryss)
   * Ja, 2-5 mnd □
   * Ja, 6-12 mnd □
   * Ja, mer enn 1 år □
   * Nei, aldri □

106. Har du noen gang fått behandling av lege for:
   Ja □
   Nei □
   * Underlivsbetennelse (eggstokkbetennelse, egglederbetennelse) □
   * Utflod □
   * Menstruasjonssmerter □

107. Har du noen gang brukt p-pill eller minipiller?
   Ja □
   Nei □

HVIS DU HAR SVART «NEI»: GÅ TIL SISTE SIDE

108. Hvor gammel var du første gang du brukte p-pill?
   _____år

109. Hvor lenge har du brukt p-pill i alt?
   _____år

110. Bruker du p-pill nå?
    Ja □
    Nei □
112. Har du begynt å komme i stemmeskiftet? (Sett ett kryss)
   * Nei, har ikke begynt ennå ........................................... ☐
   * Ja, har såvidt begynt .................................................. ☐
   * Ja, har helt tydelig begynt .......................................... ☐
   * Det virker som om stemmeskiftet er ferdig .................... ☐

113. Har du begynt å få bart eller skjegg? (Sett ett kryss)
   * Nei, har ikke begynt ennå ........................................... ☐
   * Ja, har såvidt begynt .................................................. ☐
   * Ja, har helt tydelig begynt .......................................... ☐
   * Ja, har fått en god del skjeggvekst .............................. ☐

114. Har du vært behandlet hos lege for: (Sett ett kryss for hver linje).

   Ja  Nei

   * Trang forhud .............................................................. ☐ ☐
   * Utflod fra urinrøret .................................................. ☐ ☐
   * Betennelse i forhuden eller pungen (testiklene) ............. ☐ ☐
KOMMENTARER

Hvis du har tid kan du gjerne skrive litt om det du synes er viktig, men som det ikke er spurt etter i spørreskjemaet. Hvordan synes du det er å være ung i dag? Er det noe du mener kan bli bedre når det gjelder helse og trivsel for dere som er unge?
Nå er det din tur til å delta i den store helseundersøkelsen i Nord-Trøndelag (hunt)!

Vi håper du har lest igjennom informasjonen du fikk med hjem om ung-hunt og bestemt deg for å være med!

Les nå først gjennom samtykkeerklæringen som ligger i spørreskjemaet. Sjekk at det er ditt navn som står der!

Kryss av for om du vil delta eller ikke, og undertegn.

Lever denne lappen til læreren. Alle lappene legges i en konvolutt som klistres igjen.

Navnet ditt skal IKKE være med på spørreskjemaet!


Alle svarene dine blir behandlet med taushetsplikt!

Ingen på skolen får se svarene dine.

Hvis du ønsker å snakke med noen om undersøkelsen, kan du ta kontakt med ung-hunt-sykepleieren på skolen din eller ringe Folkehelsa i Verdal (se baksiden).

Lykke til og tusen takk!
Dato for utfylling av skjema: ____/___19___

1. Er du gutt eller jente?  
   GuttskJente

2. Hvilken klasse går du i?  
   Allmennfaglig Yrkesfaglig
   * 1. videregående ................................................. ☐ ☐
   * 2. videregående ................................................. ☐ ☐
   * 3. videregående ................................................. ☐ ☐
   * Folkehøgskole ................................................... ☐

3. Hvilke planer for videre utdanning har du? (Sett ett eller flere kryss)
   * Ingen ............................................................. ☐
   * Høgskole eller universitet i 4 år eller mer ........................................................................ ☐
   * Høgskole eller universitet mindre enn 4 år ........................................................................ ☐
   * Annen yrkesutdanning ........................................... ☐
   * Vet ikke ........................................................................... ☐

   OM DER DU BOR

4. Hvilken type bolig (hus) bor du i? (Sett bare ett kryss)
   * Enebolig/villa ......................................................... ☐
   * Gardsbruk .................................................................... ☐
   * Blokk/terasseleilighet ............................................. ☐
   * Rekkehus/2-4 mannsbolig ........................................ ☐
   * Annen bolig ................................................................... ☐

5. Hvem bor du sammen med nå? (Her kan du sette ett eller flere kryss)
   * Mor ............................................................................ ☐
   * Fars nye kone eller samboer .................................... ☐
   * Far ............................................................................. ☐
   * Ektefelle/samboer/venner ........................................... ☐
   * 1-2 søsken ..................................................................... ☐
   * Alene/på hybel .......................................................... ☐
   * 3 eller flere søsken ..................................................... ☐
   * Fosterforeldre .................................................................. ☐
   * Mors nye mann eller samboer .................................... ☐
   * Andre ........................................................................... ☐

6. Er det heldekkeende tepper (teppegulv) hjemme hos deg:
   - i stua? Ja ☐ Nei ☐
   - på soverommet ditt? Ja ☐ Nei ☐

7. Er det katt i boligen (hjemme hos deg)? Ja ☐ Nei ☐

8. Er det hund i boligen (hjemme hos deg)? Ja ☐ Nei ☐

9. Er det andre pelskledd dyr i boligen (hjemme hos deg)?Ja ☐ Nei ☐
Disse spørsmålene står bare i spørreskjemaet for dere som går i videregående skole.

115. Har du i løpet av det siste året ofte følt at du har presset deg, eller stadig drevet deg selv framover?  
   Ja □  Nei □  Vet ikke □

116. Føler du deg under tidspress, også når det gjelder daglige gjøremål?  
   * Alltid, eller nesten alltid ....................... □
   * Noen ganger ........................................... □
   * Aldri ..................................................... □

117. Har du hatt tanker om å ta ditt eget liv?  
   Ja □  Nei □

118. Har du noen gang prøvd hasj, marihuana eller lign.?  
   Ja □  Nei □

119. Har du noen gang brukt anabole steroider eller andre dopingmidler?  
   Ja □  Nei □

120. Hvis ja, hvor gammel var du første gang?  
   _____år

121. Har du noen gang hatt samleie?  
   Ja □  Nei □

122. For JENTER: Har du noen gang vært gravid uten at du ønsket det?  
   Ja □  Nei □

123. For GUTTER: Har en jente noen gang blitt gravid med deg uten at det var meningen?  
   Ja □  Nei □  Vet ikke □

   For BÅDE gutter og jenter:
   Hvis ja:

124. Hvor gammel var du da dette skjedde?  
   _____år

125. Ble det utført abort?  
   Ja □  Nei □  Vet ikke □
Hvis du har tid, kan du gjerne skrive litt om det du synes er viktig, men som det ikke er spurt etter i spørreskjemaet. Hvordan synes du det er å være ung i dag? Er det noe du mener kan bli bedre når det gjelder helse og trivsel for dere som er unge?

Vennlig hilsen

Folkehelsa
Statens institutt for folkehelse
Seminarer medisinsk forskningssenter.
Verdal

Kjell Terje Gunderson
høgskolledosent,
prosjektansvarlig ved
Høgskolen i Nord-Trøndelag
Levanger

Tund Lingaas Holmen
overlege, prosjektleder
Folkehelsa, Verdal

Tlf. 74 07 71 44
YOUNG-HUNT
The Nord-Trøndelag Health Study

Date: ___ / ____ 19___

1. Are you male or female? Male Female

2. What grade are you in? Academic Vocational
   2nd year high school
   3rd year high school
   4th year high school
   People's High School, Senior Primary School

3. Do you plan to continue your studies? (Check one or more boxes)
   No College or university for 4 years or more
   College or university, less than 4 years Vocational school
   Don't know

ABOUT WHERE YOU LIVE

4. What type of housing do you live in? (Check only one box)
   House Farm
   Apartment Row house
   Another type

5. Who do you live with at this time? (Check one or more boxes)
   Mother Father's new wife or partner
   Father Spouse/partner (boyfriend or girlfriend)/friends
   1-2 siblings Alone/in a rented room
   3 or more siblings Foster parents
   Mother's new husband or partner Other

6. Is there wall to wall carpeting where you live: Yes No
   - In the living room?
   - In your bedroom?

7. Is there a cat where you live (in your home)? Yes No

8. Is there a dog where you live (in your home)? Yes No

9. Are there other animals with fur where you live (in your home)? Yes No

ABOUT YOUR HEALTH

10. How is your overall health at this time? (Check the box that best describes your health)
    Poor Good
    Not very good Very good

11. Are you disabled in any of these ways? (Check one box on each line) No Little Somewhat Very
    Restricted movement
    Impaired vision
    Impaired hearing
    Restricted due to physical disease
    Restricted due to mental illness
12. Have you had any of these ailments in the past 12 months? Never Seldom Sometimes Often
(Check one box on each line)
A Headache (without known medical cause)
B Neck or shoulder pain
C Joint or muscle pain
D Stomach pain (without known medical cause)
E Nausea
F Constipation
G Diarrhea, upset stomach
H Palpitations
I Bronchitis or pneumonia
J Ear infection
K Sinus infection

13. If you have answered "never" to all the above listed ailments: Have you had any of these
ailments often earlier (meaning before the last 12 months)? Yes No
If yes: Which ailment (see above) was it? (Write the name of the ailment or letter from above)

14. Have you ever had wheezing or whistling in the chest at any time in the past? Yes No
If you answered "NO", please skip to question 19

15. Have you had wheezing or whistling in the chest in the last 12 months? Yes No
If you answered "NO", please skip to question 19

16. How many attacks of wheezing have you had in the last 12 months?
   None 1 to 3 4 to 12 More than 12

17. In the last 12 months, how often, on average, has your sleep been disturbed due to wheezing?
   Never woken with wheezing Less than one night per week One or more nights per week

18. In the last 12 months, has wheezing ever been severe enough to limit your speech to only one or
two words at a time between breaths? Yes No

19. Have you ever had asthma? Yes No

20. In the last 12 months, has your chest sounded wheezy during exercise? Yes No

21. In the last 12 months, have you had a dry cough at night, apart from a cough associated with a
cold or chest infection? Yes No

22. Have you ever had an itchy rash that has lasted at least 6 months? Yes No
If you have answered "NO", go to question 27
23. Have you had this rash during the last 12 months?  
Yes  No

If you have answered "NO", go to question 27

24. Was the rash ever on any of the following places: elbow (on the crease side), behind the knee, front of the ankles, under the buttocks or around the neck, ears or eyes?  
Yes  No

25. Has the rash ever been completely gone during the past 12 months?  
Yes  No

26. During the last 12 months, how often on the average have you been kept awake at night due to this rash?  
Not at all in the last 12 months
Less than 1 night a week
1 or more nights a week

27. Have you ever had eczema?  
Yes  No

---

**ABOUT NASAL PROBLEMS**

All these questions concern problems that occur when you do NOT have a cold or the flu.

28. Have you ever had problems with sneezing and/or a clogged or runny nose when you do NOT have a cold or the flu?  
Yes  No

If you have answered "NO", go to question 33

29. During the last 12 months, have you had problems with sneezing and/or a clogged or runny nose when you do NOT have a cold or the flu?  
Yes  No

If you have answered "NO", go to question 33

30. During the last 12 months, have these nasal problems been accompanied by itchy, watery eyes?  
Yes  No

31. In which of the last 12 months have you had nasal problems?  
(Check the box for every month that you have had problems)
January  May  September
February  June  October
March    July  November
April    August December

32. During the last 12 months, how much have these nasal problems interfered with your daily activity?  
Not at all  A little  Much  Very much

33. Have you ever had hay fever or nasal allergies?  
Yes  No
### ABOUT ALLERGIES

34. **Do you have any allergies?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>I don’t know</th>
</tr>
</thead>
</table>

If you have answered "NO", go to question 37

35. **What do you think you are allergic to?** Check the boxes for how you are affected by each item listed in the left column. (Check one or more box for each line.)

- Dogs
- Cats
- Other animals
- Grass/trees
- Dust
- Food
- Smoke
- Other

36. **Has your doctor given you any allergy tests (blood tests, skin tests)?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

### ABOUT MEDICINE

37. **Do you use any of these medicines or supplements?** Think about what you use these for.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Sometimes</th>
<th>Almost daily</th>
</tr>
</thead>
</table>
- Pain relievers
- Migraine medicine
- Sleeping medicine
- Nerve medicine
- Relaxants
- Asthma medicine
- Allergy medicine
- Eczema cream
- Laxatives
- Iron supplements
- Vitamins
- Cod liver oil
- Homeopathic medicine, natural healing aids
- Other

List “other” here: ____________________________

### ABOUT OTHER ILLNESSES

38. **Has a doctor diagnosed you with:**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
- Epilepsy
- Diabetes
- Migraines

39. **Have you had an illness that has lasted longer than 3 months?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

If "yes": What type(s)? ______________________

### ABOUT TOBACCO

40. **Does anyone you live with smoke at home?** (Check one or more boxes)

<table>
<thead>
<tr>
<th></th>
<th>Yes, my mother</th>
<th>Yes, a sibling</th>
</tr>
</thead>
</table>
- No, nobody
- Yes, my father
- Yes, other
41. Have you tried smoking? (at least one cigarette)  

| Yes | No |

If you have answered "NO", go to question 45

42. Do you smoke? (Check a box and write in the number of cigarettes. A package of loose tobacco equals approx. 50 cigarettes.)

| Yes, I smoke about ____ cigarettes daily. |
| Yes, I smoke sometimes, but not daily. |
| No, not anymore, but previously I smoked once a while. |
| No, not anymore, but previously I smoked about ____ cigarettes daily. |
| No, I don’t smoke. |

If you have answered "NO, I DON'T SMOKE", go to question 45

43. How old were you when you began smoking?  

| ______ years old |

44. How many years total have you smoked daily?  

| ______ years |

45. Does the smell of smoke bother you:  

| Never | Sometimes | Often |

- At school?  
- At home?

46. Do you use or have you used snuff, chewing tobacco or similar products?  

| No, never | Yes, but I have quit | Yes, sometimes | Yes, everyday |

If you have answered "NO, NEVER", go to question 50

47. How old were you when you began using snuff/chewing tobacco?  

| ______ years old |

48. How many years total have you used snuff/chewing tobacco?  

| ______ years |

49. How many boxes/bags of snuff/chewing tobacco do you use in a week?  

| ______ (number) |

---

**ABOUT SPORTS AND EXERCISE**

50. Not during the average school day: How many days a week do you play sports, or exercise to the point where you breathe heavily and/or sweat? (Check only one box)

| Everyday | Not every week, but at least once every two weeks |
| 4-6 days a week | Not every 14th day, but at least once a month |
| 2-3 days a week | Less than once a month |
| 1 day a week | Never |

51. Not during the average school day: How many hours a week do you play sports, or exercise to the point where you breathe heavily and/or sweat? (Check only one box)

| None | About 2-3 hours |
| About ½ hour | About 4-6 hours |
| About 1 hour | 7 or more hours |

52. Do you use asthma medication before you exercise, train or compete in sports?  

| Yes | No |

53. Are you actively involved in sports?  

| Yes | No, but I was earlier | No |
If you have answered "NO" (never have been actively involved in sports), go to question 59

54. If you no longer participate in sports: How old were you when you stopped? _____ years old

55. Which sport(s) do/did you participate in? (Check one or more boxes)
A Skiing (cross country, biathlon )
B Skiing (downhill, slalom, ski jump)
C Soccer/football
D Horse riding
E Skating, ice hockey
F Handball, basketball, volleyball
G Asian fighting sports, boxing
H Body building
I Cycling
J Weight lifting
K Track and field/orientation
L Swimming
M Gymnastics
N Other: What?

56. Do you participate in competitive sports? (Check one box)
Yes No, but I used to participate No

If you have answered "NO" (never partisipated in competitive sports), go to question 59

57. At what level do/did you participate in competitive sports? (Give highest level)
Local level (championships, series, etc.) Regional or state level National level

58. In which sports are/were you active in?
(In order of participation level, list 3 sports you are/were active in.)
I am/have been most active in and have/had participated for _____ years.
I am/have also been active in and have/had participated for _____ years.
I am/have also been active in and have/had participated for _____ years.

YOUR GENERAL WELL-BEING

59. When you think about how things are generally going for you, are you basically satisfied or dissatisfied?
(Check only one box)
Completely satisfied Rather dissatisfied
Very satisfied Very dissatisfied
Quite satisfied Totally dissatisfied
So-so

60. In general, do you feel strong and good humored or tired and worn out? (Check only one box)
Very strong and good humored Quite tired and worn out
Strong and good humored Tired and worn out
Quite strong and good humored Extremely tired and worn out
So-so

61. Are you generally happy or sad? (Check only one box)
Feel very down (sad) Rather happy
Feel down (sad) Happy
Feel rather down (sad) Very happy
So-so

62. How do you picture yourself? Check a box for each sentence below indicating whether you agree or disagree in how it relates to you. (Check one box for each line)
I have a positive attitude toward myself.
I feel rather useless at times.
I feel that I don’t have much to be proud of.
I feel that I’m a valuable person, at least equal to other people.

63. During the last month have you:

Had difficulty falling asleep?  
Woken up too early and not been able to sleep again?

64. The questions below regard how you behave, feel and deal with things (act).

Check the answer that best describes you, either Yes or No for each line.  

Are you a relatively lively person?
Would you be affected by seeing a child or animal suffer?
Do you like to meet new people?
Are your feelings easily hurt?
Do you often run out of energy?
Do you like to tease people even though it may hurt them?
Are you often worried?
Are good manners and cleanliness important to you?
Do you worry that terrible things could happen?
Do you regularly take the first step in making friends?
Are you mostly quiet when you are around others?
Do you like to be on time for appointments?
Do you often feel tired and unmotivated for no reason?
Do many people try to avoid you?
In the company of others, can you keep a party going?
Are you bothered by an embarrassing experience long after it happens?
Do you like to have a lot of things going on around you?
Do people tell you a lot of lies?

65. Below is a list of some problems. Have you been bothered by any of these in the last 14 days?

(Click one box for each line)  

Been consistently afraid and anxious
Felt tense or uneasy
Felt hopelessness when you think of the future
Felt deserted or sad
Worry too much about various things

66. During the last month have you been bothered by nervousness (irritability, uneasiness, tenseness or restlessness)?

Almost always  Often  Sometimes  Never

67. Think back over the last week, the last 7 days. If you did any of the things listed below, about how many times did you do it. (Check one box for every point)

Not once  Once  2 or 3 times  4 times or more

Visited someone you know
Received a visit
Read a book you liked
Listened to music or played an instrument longer than 15 minutes
Were out for more than 2 hours (in a row) with friends
Were at a meeting or training with a club or team
Were active in a hobby
Watched television or a video
Did homework longer than 1 hour
68. How many teams or clubs are you a part of? (for example: sports team, girl or boy scouts, band, etc.)

None   One   2 or more

**ABOUT FRIENDS**

69. Do you have someone that you have considered your best friend through most of school?  
Yes     No

70. Do you sometimes feel lonely? (Check one box)
Very often   Rarely
Often        Very rarely or never
Sometimes

71. Are your parents separated or divorced, or have they lived separately for more than a year?  
(Check a box and write in your age where necessary)
No
Yes, they lived separately or were separated when I was ____ years old, but they later moved back together again.
Yes, they were divorced or moved away from each other when I was ____ years old.

72. If you have siblings, how good a relationship do you feel you have with your sister or brother? If you have several siblings, think about the one you have the best relationship to. (Check one box)
Much worse than normal   Better than normal
Worse than normal        Much better than normal
Average
I do not have siblings

73. About how many close friends do you have? Include those you can speak to confidentially and those that help you when you need it. Do not include those people you live with, but include other relatives. (Check one box)
None   2 or more
One    4 or more

74. Do you have a steady boy-/girlfriend?  
Yes     No

75. Do you feel that you have enough friends?  
Yes     No

**ABOUT SCHOOL**

76. Do any of the below items happen to you at school, or have happened before?  
(Check one box for each line)

Have difficulties concentrating during class
Think that gym or art is fun
Think other classes are fun
Argue with the teacher
Look forward to going to school
Skip school
Understand what is being taught
Have fun during recess/break time
Satisfied with your test results
Have fistfights
Teased/harassed by other students
Reprimanded by the teacher

Never  Sometimes  Often  Very often
Can’t manage to be calm during class
Become bored or dissatisfied

**ABOUT MEALS AND EATING HABITS**

77. How often do you eat at these mealtimes? (Check one box for each line)
   Breakfast
   Lunch
   Dinner
   Everyday
   4-6 days a week
   1-3 days a week
   Seldom or never

78. Are you trying to lose weight?
   No, I’m comfortable with my weight
   No, but I need to lose weight
   Yes

79. How often does it occur that you don’t eat your lunch even though you brought one with you?
   (Check one box)
   Every school day
   4-6 days a week
   Seldom or never
   I never bring a lunch with me

80. How often do you drink or eat the things listed below? (Check a box for each line)
   Cola, soda or other soft drinks
   Light milk/skim milk
   Whole milk
   Coffee
   Potato chips and such
   Candy, chocolate and other sweets
   French fries, hamburgers or hot dogs
   Whole grain bread/rye crisps
   Butter
   Margarine
   Fruit
   Vegetables
   More than once a day
   Once a day
   Every week but not everyday
   Seldom
   Never

81. Do you consider yourself: (Check one box)
   Very large
   Thin
   A little chubby
   Very thin
   About the same as others

82. Below are listed things that concern your eating habits.
   Check the boxes according to how they apply to you.
   (Check one box for each sentence)
   When I first begin eating it can be difficult to stop.
   I use a lot of time thinking about food.
   I feel that food controls my life.
   When I eat I cut my food up in small pieces.
   I use more time than others to finish a meal.
   Older people think I’m too thin.
   I feel that others pressure me to eat.

**ABOUT ALCOHOL**

83. Have you ever tried drinking alcohol? (Meaning alcoholic beer, wine, hard liquor or moonshine)
   Yes
   No
   I don’t know
84. Have you ever drunk so much alcohol that you felt intoxicated (drunk)? (Check one box)
   No, never
   Yes, once
   Yes, 2-3 times
   Yes, 4-10 times
   Yes, more than 10 times

85. About how much beer, wine or hard liquor do you usually drink during two weeks? Don't count beer free for alcohol. Mark 0 if you don't drink alcohol.
   Beer   ___ number of 1/2 bottles
   Hard alcohol, liquors   ___ number of glasses (approx. 1/2 dl)
   Wine    ___ number of glasses (approx. 1 dl)
   Moonshine   ___ number of glasses (approx. 1/2 dl)

86. On which day during the week do you most often drink alcohol? (Check one or more boxes)
   I don't drink
   Fridays
   Weekdays
   Saturdays

87. Have you ever seen either of your parents intoxicated? (Check one box)
   Never
   A few times during the year
   A few times a month
   A few times a week

---

**READING AND WRITING DIFFICULTIES**

88. How often do you feel that your reading or writing skills are inefficient for the tasks you do at school and/or in your spare time?
   Never  Seldom  Sometimes  Often  Always
   Reading
   Writing

89. Have you had any particular reading or writing problems in the last 12 months?
   Reading  A lot of problems  Some problems  No problems
   Writing

90. Do you receive help for any reading or writing problems at this time?  Yes  No

91. Have you had reading or writing problems earlier, but not within the last 12 months?
   Yes  No

92. Do you have any speaking difficulties?
   If yes, which one(s):
   Stuttering
   Pronunciation difficulties
   Problems with my voice
   Difficulties expressing myself

---

**ABOUT HEALTH SERVICES**

93. During the last 12 months have you been to: (Check a box for every line)
   Yes  No
   General practitioner (a doctor outside the hospital)
   Doctor at the hospital (not having been admitted)
   Psychologist
   Physical therapist
   Chiropractor
Homeopath
Other treatment (natural medicine, foot reflexology, healer, psychic, etc.)

94. **Have you ever been admitted to the hospital** (not including when you were born)?
No, never  Yes, once  Yes, more than once
If yes: **Have you been admitted to the hospital during the last 12 months?**
Not at all  1-3 times  More than 3 times

95. **How often have you been to the school health center during the last 12 months?**

96. **Have you ever on your own accord contacted the school health center?**

97. **Would you like to have more contact with the school health center than you have had?**

98. **How often have you been absent from school due to illness during the last 12 months?**
Less than 1 week  1-2 weeks  More than 2 weeks

### ABOUT DEVELOPMENT

You are now at the age when your body has begun to change and become more like an adult's body. Below are some questions about physical changes that occur in young people around your age.

99. **During the teenage years there are periods where one grows quickly (a growing spurt). Have you noticed that your body has grown quickly (you've become taller)?** (Check one box)
No, I have not had any growing spurts
Yes, I have barely begun a growing spurt
Yes, it is quite clear that I have had a growing spurt
Yes, it seems as though I'm finished with growing spurts

100. **Concerning hair on your body (under your arms and your crotch/groin)? Would you say that the hair on your body has:** (Check one box)
Not begun to grow yet
 Barely begun to grow
 Quite clearly begun to grow
 It seems as though my body hair has grown in

101. **When you look at yourself, do you think that you physically matured earlier or later than others your own age?**
(One box)
Much earlier  A little bit later
Somewhat earlier  Somewhat later
A little bit earlier  Much later
The same as others

### QUESTIONS FOR GIRLS ONLY

102. **Have you begun to develop breasts?** (Check one box)
No, haven't begun yet
Yes, have quite clearly begun
Yes, have barely begun
It seems as though my breasts are fully developed

103. **Have you begun menstruating (gotten your period)?**
Yes  No

If you have answered "NO", go to question 106
104. How old were you when you first began menstruating?
I was ____ years and ____ months old.

105. Have you ever missed (not gotten) your period for several months after a regular period (without being pregnant)?
(Check one box)
Yes, for 2-5 months  Yes, for more than a year
Yes, for 6-12 months  No, never

106. Have you ever been treated by a doctor for:
Inflammation/infection of the reproductive system (ovarian, fallopian tubes)
Discharge
Pain with menstruation
Yes  No

107. Have you ever used birth control pills or the mini pill?
Yes  No

If you have answered "NO", go to the last page

108. How old were you when you first began to use birth control pills?
____ years old

109. How long in total did you use birth control pills?
____ years

110. Do you use birth control pills now?
Yes  No

**QUESTIONS FOR BOYS ONLY**

112. Has your voice begun to change? (Check one box)
No, hasn’t begun yet
Yes, has just barely begun
Yes, has clearly begun
It seems as though my voice has finished changing

113. Have you begun to get a mustache or beard? (Check one box)
No, hasn’t begun yet
Yes, has just barely begun
Yes, has clearly begun
Yes, I have quite a lot of facial hair

114. Have you been treated by a doctor for: (Check a box for every line)
Tight foreskin
Discharge from the penis (urethra)
Inflammation in the foreskin or scrotum (testicles)

**FOR STUDENTS IN HIGH SCHOOL**

These questions are directed to high school students only.

115. During the last year have you often felt that you were pressuring yourself or were constantly pushing yourself to continue?
Yes  No  I don’t know

116. Do you feel pressed for time even in regards to daily tasks?
Always, or almost always
Sometimes
Never
117. Have you ever had thoughts about taking your own life? Yes No

118. Have you ever tried hash, marijuana or related drugs? Yes No

119. Have you ever used steroids or other drugs to build muscles and/or enhance physical endurance? Yes No

120. If yes, how old were you the first time? ___ years old

121. Have you ever had sexual intercourse? Yes No

122. For GIRLS: Have you ever been pregnant when you didn’t want to be? Yes No

123. For BOYS: Have you ever gotten a girl pregnant without intending to? Yes No I don’t know

For BOTH boys and girls:

If yes:

124. How old were you when this happened? ___ years old

125. Was the result an abortion? Yes No I don’t know
Appendix 2

Definitions, groupings and dichotomization of variables used in Papers I-IV

Questions from the interview used in this thesis
Definitions, groupings and dichotomization of variables used in Papers I-IV

Smoking habits

Occasional smokers are defined as those who answered “yes” to the question “Have you ever tried smoking (at least one cigarette)?” (q 41) and “yes, I smoke occasionally, but not daily” to the question “Do you smoke yourself?” (q 42).

Daily smokers are defined as those who answered “yes” to the question “have you ever tried smoking (at least one cigarette)?” (q 41) and to the question “Do you smoke yourself?” (q 42) marked the alternative “Yes, I smoke_(number)_cigarettes daily” and listed the amount of cigarettes. Those who listed the number of cigarettes smoked daily without marking the question were also included.

Current smokers are defined as those who answered “yes” to either daily or occasional smoking.

Pack years was defined as the number of years with daily smoking multiplied by the number of cigarettes smoked daily divided by twenty. It was grouped as follows: “Never smokers”: those who had never tried smoking; “Light smokers”: pack years greater than zero, but less than one; “Medium smokers”: pack years one or greater, but less than two; “Heavy smokers”: pack years two or greater.

Smoke burden refers to occasional smoking and pack years.

Passive smoking was defined as exposure to smoking at home by mothers and/or fathers and/or siblings.

Physical activity

Physical activity was assessed using frequency of exercise (q 50) divided into three groups: “exercising 4 days a week or more”, “exercising 2 to 3 days a week” and “exercising 1 day a week or less”.

1
Participation in competitions and active sports (q53, 56) were dichotomized in to “Yes” and No/no quit”.

Types of sports (q55) were divided into: “Individual high endurance sports” including cross country skiing, cycling and running; “Individual low endurance sports” including slalom, horseback riding and gymnastics; “Swimming”; “Bodybuilding and fight sports” including body building, weightlifting, boxing, judo, taekwondo and similar fight sports; and “Team sports” including football/soccer, handball, basketball and volleyball.

Health problems

Questions with more than two alternative answers were dichotomized as follows:

Perceived health (q 10): “Bad/not good” and “Good/very good”.

Disabled (q 11): “Much/some/little” and “No”.

Health problems (q 12): The more frequent ones (ABCDE) were dichotomized into “Sometimes/often” and “Never/seldom” and the less frequent ones (FGHIJK) into “Sometimes/often/seldom” and “Never.”

Medication (q 37): “Almost daily/sometimes” and “Never”.

Sleeping problems and nervousness (q 63, 66): “Most of the time/often” and “Sometimes/never”.

School absence (q 98): “One week or more” and “Less than one week”.

Hospitalization and school health service (q 94, 95): “Once or more” and “Never”.

Having allergy was defined as answering “yes” to both questions: “Are you allergic?” (q 34) and “Have you been allergy tested (skin or blood test) by a physician?” (q 36).
Current wheeze was defined as answering “yes” to both questions: “Have you ever been wheezing?” (q 14) and “Have you been wheezing during the last 12 months?” (q 15).

Current rhinitis was defined as answering “yes” to both questions: “Have you ever had problems with sneezing and/or a clogged or runny nose when you do NOT have a cold?” (q 28) and “During the last 12 months, have you had problems with sneezing and/or a clogged or runny nose when you do NOT have a cold?” (q 29).

Acute bronchitis was defined as answering “yes” to the following question in the interview: “Do you have a cold with cough or do you have bronchitis today?”

Social factors

Questions with more than two alternative answers were dichotomized as follows:

Out with friends more than two hours at the time, did homework for more than one hour, watched TV or video (q 67): “None/one” and “2-3/4 times or more”.

Organized activity (68): “None” and “One/two or more”.

Parents divorced (q 71): “Yes, divorced or separated” and “No”. Students with parents who had moved together again were excluded.

Been drunken (q 84): “Never” and “Once/2-3/4-10/more than 10 times” or “Never/once/2-3/4-10 times” and “More than 10 times”.

Seen parents drunk (q 87): “Never” and “a few times/yearly/every month/every week”.

3
Questions from the interview used in this thesis

Er du forkjølet med hoste eller har du bronkitt i dag?  
Ja  Nei
Do you have a cold with cough or do you have bronchitis today?

Røyker du selv?  
Ja  Nei
Do you smoke?

Hvis ja, røyker du hver dag?  
Ja  Nei
If yes, do you smoke every day?

Daily smokers were defined as those who answered “yes” to both questions: “Do you smoke?” and “If yes, do you smoke every day?”

Occasional smokers were defined as those who answered “yes” to the question: “Do you smoke?”, but no to the question: “If yes, do you smoke every day?”
Appendix 3

Written information to participants and parents
Til ungdom og foresatte


Hvorfor bør ungdommene være med i helseundersøkelsen?

Ungdomsgruppen faller ofte mellom barn og voksne, og mange kommuner i Norge har ikke godt nok helsetilbud til ungdommene. Mange har ikke skolehelsetjeneste i videregående skole. Når det skapes et miljø omkring forebyggende helsearbeid i fylket er det viktig at også ungdommene tas med i dette. Målet for helseundersøkelsen er:

* å finne ut hvordan helsa til ungdommene er
* å finne ut hva som er årsakene til sykdom, og hva som gir god helse
* å bedre helsetjenesten og det forebyggende helsearbeidet for ungdom

For å kunne forebygge sykdom og gi et bedre helsetilbud til alle er det også viktig å finne ut hvordan ungdommene selv mener de har det.

Hvordan skal helseundersøkelsen gjennomføres?

Helseundersøkelsen foregår på skolen i skoletiden og inneholder følgende:

* Ungdommene blir tilbudt en klinisk undersøkelse.

* Ungdommene blir bedt om å fylle ut et spørreskjema.
  Dette gjøres i en skoletime. Spørreskjema vil inneholde spørsmål om sykdom og helse, kosthold, idrett, rus og hvordan de selv synes de har det. Spørreskjema inneholder ikke navn, men personnummer i strekkode som bare kan leses av en datamaskin. Det legges i en konvolutt som klistres igjen av eleven selv før det samles inn.

I tilslutning til undersøkelsen vil det bli tilbudt kurs til lærere og til skolehelsetjenesten om emner som omhandles i spørreskjema. I samarbeid med Høgskolen i Nord-Trøndelag (avd. for helsefag og avd. for lærerutdanning) planlegges det et opplegg for helseinformasjon og helsefremmende arbeid i skolen.
Alle opplysninger blir behandlet med taushetsplikt!

I tillegg til at de unge selv får svarene på den kliniske undersøkelsen, vil dataene bli brukt til medisinsk forskning, eventuelt ved å sammenholde opplysningene med opplysninger fra andre helseregistrer. Dette vil i tilfelle skje i samråd med Datatilsynet og Regional komite for medisinsk forskningsetikk, helseregion IV. Forskerne vil få datafiler som er anonymiserte, og det vil ikke bli offentliggjort opplysninger som kan føres tilbake til en bestemt elev. Ingen på skolen har anledning til å se svarene på spørreskjemaene.

Det er mulighet for at noen unge vil få tilbud om videre undersøkelser på et senere tidspunkt. Dette vil være unge med sykdom og plager, men også noen friske. Det er mulig til en hver tid å trekke seg fra undersøkelsen og også be om at data blir slettet.

Regional komite for medisinsk forskningsetikk, helseregion IV, tilråder undersøkelsen og Datatilsynet har også godkjent undersøkelsen.

**Undersøkelsen er selvfølgelig frivillig, men vi håper at alle ønsker å delta.**
De som ikke ønsker å delta i undersøkelsen vil få vanlig skolearbeid mens denne pågår.

På skolen blir alle unge på nytt informert om undersøkelsen og bedt om å undertegne et skriftlig samtykke samtidig som spørreskjemaet utfylles. For ungdom i alderen 13-16 år ønsker vi også foresattes tillatelse til at de unge skal delta i undersøkelsen.

Ved spørsmål, ta gjerne kontakt med Folkehelse, Verdal!


Bak undersøkelsen står: Statens Institutt for Folkehelse (Folkehelsa), Universitetet i Trondheim, Norges forskningsråd, Statens helseundersøkelser (SHUS), Fylkeslegen, Fylkesskolesjefen, Statens Utdanningskontor, Norske Kvinners Sanitetsforening (Nord-Trøndelag krets) og Høgskolen i Nord-Trøndelag(HiNT). Undersøkelsen ledes av Samfunnsmedisinsk forskningssenter (Folkehelsa), Verdal.
Appendix 4

Written consents from adolescents and parents
Hei!
Sammen med alle ungdommene i alderen 13-19 år i hele Nord-Trøndelag (ca. 13 000) blir du nå invitert til å være med i ungdomsdelen av helseundersøkelsen i Nord-Trøndelag, HUNT.

Hensikten med undersøkelsen er å få vite mer om hvordan helsa hos dere som er unge og hvordan dere selv synes dere har det. Dette er viktig for å kunne forebygge sykdom og gi et bedre helsetilbud til alle unge.


Alle svarene dine blir behandlet med taushetsplikt!

I tillegg til de svarene du selv får på undersøkelsen, vil dataene bli brukt til medisinsk forskning, eventuelt ved å sammenholde opplysningene med opplysninger fra andre helseregister. Dette vil i tilfelle skje i samråd med Datatilsynet og Regional komite for medisinsk forskningsetikk, helseregion IV. Forskerne vil få datafiler som er anonymiserte (uten navn og personnummer). Det vil ikke bli offentliggjort opplysninger om akkurat hva du har svart. Ingen på skolen får se svarene på sporreskjemaet ditt.

Du kan få tilbud om videre undersøkelser på et senere tidspunkt. Dette vil være hvis du har en sykdom eller plager, men også noen friske får et slikt tilbud. Du kan trekke deg fra undersøkelsen når som helst og også be om at dine data blir slettet.

Regional komite for medisinsk forskningsetikk, helseregion IV, tiår undersøkelsen og Datatilsynet har også godkjent undersøkelsen.

Undersøkelsen er selvsagt frivillig, men vi håper at også du vil være med!
Hvis du ikke vil være med får du skolearbeid av læreren din som du kan gjøre isteden.


SVAR---------------------------------------------------------------------------------------------------------------

☐ JA, jeg vil være med i ung-hunt ☐ NEI, jeg vil ikke være med

☐ Provesvar kan sendes lege... legens navn

                                      Dato                               Underskrift
Til ungdom og foresatte


Hvorfor bør ungdommene være med i helseundersøkelsen?

Ungdomsgruppen faller ofte mellom barn og voksne, og mange kommuner i Norge har ikke godt nok helsetilbud til ungdommene. Mange har ikke skolehelsetjeneste i videregående skole. Når det skapes et miljø omkring forebyggende helsearbeid i fylket er det viktig at også ungdommene tas med i dette. Målet for helseundersøkelsen er:

* å finne ut hvordan helse til ungdommene er
* å finne ut hva som er årsakene til sykdom, og hva som gir god helse
* å bedre helsetjenesten og det forebyggende helsearbeidet for ungdom

For å kunne forebygge sykdom og gi et bedre helsetilbud til alle er det også viktig å finne ut hvordan ungdommene selv mener de har det.

 Hvordan skal helseundersøkelsen gjennomføres?

Helseundersøkelsen foregår på skolen i skoletiden og inneholder følgende:


* Ungdommene blir bedt om å fylle ut et sporreskjema. Dette gjøres i en skoletime. Sporreskjema vil inneholde spørsmål om sykdom og helse, kosthold, idrett, rus og hvordan de selv synes de har det. Sporreskjema inneholder ikke navn, men personnummer i strekkode som bare kan leses av en datamaskin. Det legges i en konvolutt som klistres igjen av eleven selv før det samles inn.

I tilslutning til undersøkelsen vil det bli tilbudt kurs til lærere og til skolehelsetjenesten om emner som omhandles i sporreskjema. I samarbeid med Høgskolen i Nord-Trøndelag (avd. for helsefag og avd. for lærerutdanning) planlegges det et opplegg for helseinformasjon og helsefremmende arbeid i skolen.
Alle opplysninger blir behandlet med taushetsplikt!

I tillegg til at de unge selv får svarene på den kliniske undersøkelsen, vil dataene bli brukt til medisinsk forskning, eventuelt ved å sammenholde opplysningene med opplysninger fra andre helseregister. Dette vil i tilfelle skje i samråd med Datatilsynet og Regional komite for medisinsk forskningsetikk, helseregion IV. Forskerne vil få datafiler som er anonymiserte, og det vil ikke bli offentliggjort opplysninger som kan føres tilbake til en bestemt elev. Ingen på skolen har anledning til å se svarene på spørreskjemaene.

Det er mulighet for at noen unge vil få tilbud om videre undersøkelser på et senere tidspunkt. Dette vil være unge med sykdom og plager, men også noen friske. Det er mulig til en hver tid å trekke seg fra undersøkelsen og også be om at data blir slettet.

Regional komite for medisinsk forskningsetikk, helseregion IV, tilrår undersøkelsen og Datatilsynet har også godkjent undersøkelsen.

Undersøkelsen er selvfølgelig frivillig, men vi håper at alle ønsker å delta. De som ikke ønsker å delta i undersøkelsen vil få vanlig skolearbeid mens denne pågår.

På skolen blir alle unge på nytt informert om undersøkelsen og bedt om å undertegne et skriftlig samtykke samtidig som spørreskjemaet utfylles. For ungdom i alderen 13-16 år ønsker vi også foresattes tillatelse til at de unge skal delta i undersøkelsen.

Ved spørsmål, ta gjerne kontakt med Folkehalsa, Verdal!

Vennlig hilsen

Turid Lingaas Holmen
barnelege, prosjektleder
Folkehalsa, Verdal tlf. 74 07 71 44

Kjell Terje Gundersen
høgskoledent, prosjektansvarlig
ved Høgskolen i Nord-Trøndelag (HiNT)

Bak undersøkelsen står: Statens Institutt for Folkehelse (Folkehalsa), Universitetet i Trondheim, Norges forskningsråd, Statens helseundersøkelser (SHUS), Fylkeslegen, Fylkesskolesjefen, Statens Utøvingskontor, Norske Kvinner Sannitetsforening (Nord-Trøndelag krets) og Høgskolen i Nord-Trøndelag(HiNT). Undersøkelsen ledes av Samfunnsmedisinsk forskningssenter (Folkehalsa), Verdal.
VI BER OM AT SVARSLIPPEN NEDENFOR FYLLES UT AV FORESATTE OG LEVERES TIL SKOLEN

Barnets navn.................................................................Kommune.................................

Skole..............................................................................Klasse......................................

☐ Ja, jeg gir tillatelse til at mitt barn kan delta i ung-hunt, ungdomsdelen av Helseundersøkelsen i Nord-Trøndelag.

☐ Nei, jeg gir ikke tillatelse til at mitt barn kan delta i ung-hunt.

☐ Hvis prøvesvarene ikke er tilfredstillende ønsker jeg at de skal sendes til lege.

  Navnet på legen:...........................................................................................................

  Hvis den unge ikke har noen fast lege sendes svaret til kommunlege I

☐ Jeg ønsker ikke at prøvesvarene skal sendes til lege

.......................................................... Dato .......................................................... Foresattes underskrift
Appendix 5

Instructions to teachers
Informasjon til lærere i ungdomsskolen


Før utfulling av spørreskjema:

Spørreskjemaet har en strekkode. Det må ikke skrives navn på spørreskjema (konfidensiell behandling)! Skjema må ikke byttes mellom elever! Strekkoden må ikke rives av eller klusses på!

Samtykkeerklæringen ligger inne i spørreskjema (gult ark). Den er påklistret elevens navn og fødselsdato. Elevene må kontrollere om de har fått rett samtykkeerklæring. Alle elever som har fått konvolutt skriver navnet sitt på samtykkeerklæringen og krysser av for ja eller nei. Læreren samler inn samtykkeerklæringene (hele arket) og legger dem i vedlagte konvolutt.

Ved utfulling av spørreskjema:

Disse retningslinjene er viktige ved utfullingen av spørreskjema:

1. Uttrykningen skjer som ved en prøve eller eksamen. (Elevene sitter ved hver sin pult. De kan ikke gå mellom pultene eller snakke med hverandre.)

2. Elevene kan ikke forlate klasserommet før timen er ferdig. (Dersom en elev må forlate klasserommet, legges spørreskjemaet i konvoluten midlertidig. Elever som blir ferdige tidlig, får andre oppgaver resten av timen.)

3. Elevene som ikke ønsker å være med på undersøkelsen, er tilstede, men får andre oppgaver.

4. Læreren skal ikke tolke spørsmålene for eleven. (Dersom elevene ikke klarer eller ikke ønsker å svare på spørsmål, kan de hoppe over disse.)

5. Lesesvake elevener kan samles spesielt (eks.vis i «desestudio») slik at læreren kan lese spørsmålene hoyt for elevene. (Læreren må ikke sitte/stå så nært elevene at svarene kan ses!)

6. Spørreskjemaet leveres inn selv om eleven ikke blir helt ferdig. (NB! Det er svært viktig at elevener som ikke blir ferdige får benytte lengre tid til utfullingen, eks.vis. friminutt, utvidet skoletime ol.)


g://urid/ung/unlærtung.doc
Informasjon til lærere i videregående skole

Hver klasse har fått utdelt konvolutter som inneholder spørreskjema og samtykkeerklæring for hver enkelt elev. Etter avtale med rektor skal elevene ved din skole fylle ut vedlagte spørreskjema i løpet av samme skoletime.

For uttylling av spørreskjema:

Spørreskjemaet har en strekkode. Det må ikke skrives navn på spørreskjema (konfidiensiell behandling)! Skjema må ikke byttes mellom elever!

Samtykkeerklæringen ligger inne i spørreskjema (gult ark). Den er påklistret elevens navn og fødselsdato. Elevene må kontrollere om de har fått rett samtykkeerklæring. Alle elever skal skrive navnet sitt på samtykkeerklæringen og kryss av for ja eller nei. Læreren samler inn samtykkeerklæringene (hele arket) og legger dem i vedlagte konvolutt.

Ved uttylling av spørreskjema:

Disse retningslinjene er viktige ved uttyllingen av spørreskjema:

1. **Uttynnign skjer som ved en prøve eller eksamen.** (Elevene sitter ved hver sin pult. De kan ikke gå mellom pultene eller snakke med hverandre.)

2. **Elevene kan ikke forlate klassesommet før timen er ferdig.** (Dersom en elev må forlate klassesommet, legges spørreskjemaet i konvoluten midlertidig. Elever som blir ferdige tidlig, får andre oppgaver resten av timen.)

3. **Elever som ikke ønsker å være med på undersøkelsen, er tilstede, men får andre oppgaver.**

4. **Læreren skal ikke tolke spørsmålene for eleven.** (Dersom elevene ikke klarer eller ikke ønsker å svare på spørsmål, kan de hoppe over disse.)

5. **Lesesvake elever kan samles spesielt (eks.vis i «desestudio») slik at læreren kan lese spørsmålene høyt for elevene.** (Læreren må ikke sitte/stå så nær elevene at svarene kan ses!)

6. **Spørreskjemaet leveres inn selv om eleven ikke blir helt ferdig.** (NB! Det er svært viktig at elever som ikke blir ferdige får benytte lengre tid til uttyllingen, eks.vis. friminutt, utvidet skoletime ol.)

7. **Eleven legger selv spørreskjemaet inn i vedlagte konvolutt. Navnet på limstrimmelen fjernes og konvoluten klistres igjen.**

8. **Læreren samler inn konvoluttene. Konvoluten med samtykkeerklæringene og spørreskjema konvoluttene leveres klassevis til skolens administrasjon.**
Appendix 6

Tables and figures
Figure 2.1. Perceived health, headache and neck and shoulder pains among adolescents, 13-18 years, who answered the questionnaire in the young-hunt study. Boys: n=4,249, girls: n=4,211.
Table 2.1. Subjective health problems and disability in adolescents, 13-18 years, who answered the questionnaire in the young-hunt study. Total numbers of participants: 13-15 years: boys n=2,242, girls n=2,265, 16-18 years: boys n=2,007, girls n=1,946.

<table>
<thead>
<tr>
<th>Health problems</th>
<th>Age 13-15 years</th>
<th>Age 16-18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>n</td>
<td>%</td>
<td>CI</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>----------</td>
</tr>
<tr>
<td>General</td>
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<td></td>
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<td>Self-reported poor health</td>
<td>212</td>
<td>9.6</td>
</tr>
<tr>
<td>Absent from school more than 1 week</td>
<td>462</td>
<td>22.5</td>
</tr>
<tr>
<td>Overall pain</td>
<td>1,057</td>
<td>47.1</td>
</tr>
<tr>
<td>Head/muscles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>648</td>
<td>29.7</td>
</tr>
<tr>
<td>Neck and shoulder pain</td>
<td>344</td>
<td>15.9</td>
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<tr>
<td>Muscle and joint pain</td>
<td>343</td>
<td>15.9</td>
</tr>
<tr>
<td>Gastrointestinal</td>
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<td></td>
</tr>
<tr>
<td>Stomachache</td>
<td>279</td>
<td>12.9</td>
</tr>
<tr>
<td>Constipation</td>
<td>514</td>
<td>23.9</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>568</td>
<td>26.3</td>
</tr>
<tr>
<td>Nausea</td>
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<td>11.2</td>
</tr>
<tr>
<td>Psychological</td>
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<td></td>
</tr>
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<td>Nervous/restless</td>
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<td>5.7</td>
</tr>
<tr>
<td>Sleep problems</td>
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<td>8.2</td>
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<td>Frequent heartbeats</td>
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<td>14.7</td>
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<tr>
<td>Disabilities</td>
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<tr>
<td>Disabled from motion restriction</td>
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<td>2.2</td>
</tr>
<tr>
<td>Disabled from hearing loss</td>
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<td>8.1</td>
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<tr>
<td>Disabled from physical disease</td>
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<td>6.1</td>
</tr>
<tr>
<td>Disabled from psychological disease</td>
<td>71</td>
<td>3.6</td>
</tr>
</tbody>
</table>

1. Often/sometimes during the last 12 months
2. Often/sometimes/seldom during the last 12 months
3. Most of the time/often during the last month
4. Much/some/little

Because missing data were excluded, the percentage of subjects with each health problem varied (88-100%).
Table 2.2. Respiratory symptoms and asthma in adolescents, 13-18 years, who answered the questionnaire in the young-hunt study. Total numbers of participants: 13-15 years: boys n=2,242, girls n=2,265, 16-18 years: boys n=2,007, girls n=1,946.

<table>
<thead>
<tr>
<th>Respiratory symptoms</th>
<th>Age 13-15 years</th>
<th></th>
<th>Age 16-18 years</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>CI</td>
<td>n</td>
</tr>
<tr>
<td>Bronchitis/pneumonia ¹</td>
<td>241</td>
<td>11.2</td>
<td>7.2-15.2</td>
<td>279</td>
</tr>
<tr>
<td>Sinusitis ¹</td>
<td>166</td>
<td>7.7</td>
<td>3.6-11.8</td>
<td>220</td>
</tr>
<tr>
<td>Ear ache ¹</td>
<td>337</td>
<td>15.6</td>
<td>11.7-19.5</td>
<td>347</td>
</tr>
<tr>
<td>Ever asthma</td>
<td>289</td>
<td>13.1</td>
<td>9.2-17.0</td>
<td>267</td>
</tr>
<tr>
<td>Doctor diagnosed asthma</td>
<td>268</td>
<td>94.7</td>
<td>92.0-97.4</td>
<td>235</td>
</tr>
<tr>
<td>Current asthma (symptoms last 12 months)</td>
<td>164</td>
<td>7.3</td>
<td>3.3-11.3</td>
<td>198</td>
</tr>
<tr>
<td>Wheeze last 12 months</td>
<td>443</td>
<td>20.1</td>
<td>16.4-23.8</td>
<td>630</td>
</tr>
<tr>
<td>Cough at night last 12 months</td>
<td>366</td>
<td>16.8</td>
<td>13.0-20.6</td>
<td>540</td>
</tr>
<tr>
<td>Wheeze on exercise last 12 months</td>
<td>675</td>
<td>30.8</td>
<td>27.3-34.3</td>
<td>1,012</td>
</tr>
</tbody>
</table>

¹ Often/sometimes/seldom during the last 12 months
* % of those who ever had asthma
Because missing data were excluded, the percentage of subjects with each health problem varied (88-100 %).
Table 2.3. Smoking habits in adolescents, 13-18 years, who answered the questionnaire in the young-hunt study and who reported to have or have had asthma. n=1,080.

<table>
<thead>
<tr>
<th>Smoking Habit</th>
<th>Age 13-15 years</th>
<th>Age 16-18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td></td>
<td>n  (%)</td>
<td>n  (%)</td>
</tr>
<tr>
<td>Never tried smoking, not even one cigarette</td>
<td>152 (52.6)</td>
<td>119 (44.6)</td>
</tr>
<tr>
<td>Tried smoking, but were not smokers</td>
<td>67 (23.2)</td>
<td>79 (29.6)</td>
</tr>
<tr>
<td>Previous smokers</td>
<td>27 (9.3)</td>
<td>21 (7.9)</td>
</tr>
<tr>
<td>Occasional smokers</td>
<td>14 (4.8)</td>
<td>21 (7.9)</td>
</tr>
<tr>
<td>Daily smokers</td>
<td>19 (6.6)</td>
<td>19 (7.1)</td>
</tr>
<tr>
<td>Missing</td>
<td>10 (3.5)</td>
<td>8 (3.0)</td>
</tr>
<tr>
<td>Total</td>
<td>289 (100.0)</td>
<td>267 (100.0)</td>
</tr>
</tbody>
</table>
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